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Weekly Synoptic Analyses, 5-, 2-, and 0.4- Millibar Surfaces for 1967

SILVER SPRING
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January 1970

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ESSA TECHNICAL REPORT WB 12

Weekly Synoptic Analyses, 5-, 2-, and 0.4-Millibar Surfaces for 1967

(Based on meteorological rocketsonde and high-level rawinsonde observations)

STAFF, UPPER AIR BRANCH,
National Meteorological Center

HILLCREST HEIGHTS, MD.
January 1970

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(Based on meteorological rocketsonde and high-level rawinsonde observations.)

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ABSTRACT

Data from meteorological rocketsonde and rawinsonde observations have been employed to analyze a series of high-altitude synoptic charts. Methods employed for processing the various types of data and the analysis procedure utilized are described.

Broad-scale analyses of the 5-, 2-, and 0.4-mb surfaces, primarily covering North America and adjacent ocean areas, are presented at weekly intervals for 1967. A brief discussion of the height and temperature fields is also given. A major stratospheric warming in December and a less intense event in January are among the discussion items.

INTRODUCTION

This volume represents the fourth in a continuing series of constant-pressure charts for the upper stratosphere, based on rocketsonde and very high level rawinsonde data obtained over North America and adjacent ocean areas. These charts have been analyzed by the Upper Air Branch of the Weather Bureau's National Meteorological Center (Staff 1967a, 1967b, 1969).

Computer-analyzed 10-mb charts (Environmental Science Services Administration 1967), based exclusively on rawinsonde data, are used as a foundation for hydrostatic computation of the height of the 5-mb surface. At 5 mb, both rawinsonde and rocketsonde data are used to derive the height and temperature fields. Above 5 mb, rawinsonde data are seldom available, and rocket observations constitute the basic data source. The Station Model and Reporting Rocket Stations chart (p. —) shows the locations of 19 meteorological rocket launch sites within the map analysis area for which data were available in 1967.

The present series of analyses at weekly intervals includes charts for the 5-, 2-, and 0.4-mb surfaces (approximately 36, 42, and 55 km, respectively), nominally representing broad-scale synoptic conditions on each Wednesday of the analysis period. In addition to a description of the techniques employed in obtaining these charts, a brief discussion of large-scale features is also included.

PROCESSING OF RAWINSONDE DATA

The preparation of high-level data for analysis presents many problems. Some of the difficulties encountered in the use of rawinsonde information, such as achieving compatibility between daytime and nighttime observations, extrapolation and interpolation of data, and identification of erroneous reports, have been summarized previously (Finger et al. 1965, 1966).

Temperature and height adjustments designed to compensate for instrumental radiation errors were applied to all 5-mb rawinsonde reports. Initially, an adjustment was made which reduced values from daytime observations to the level of those values reported from nighttime observations. The magnitudes of these day-night adjustments, which are intended to account for the effects of solar heating on the rod thermistor, were determined with the aid of a computer program which calculated monthly mean differences between reported daylight and darkness values. Input to this program consisted of all available 5-mb data for 1964 and 1967 from stations in North America and adjacent ocean areas that employ U.S. outrigger-type radiosonde instruments (for details of the adjustment and further references, see McInturff and Finger 1968).

Theoretical and laboratory studies of the rod thermistor used in present-day radiosondes indicate that a significant error may be induced by infrared cooling at stratospheric levels above about 10 mb. Therefore, a second adjustment (Barr 1966) was added to all reported 5-mb data, including observations made actually in darkness and daytime data that had been adjusted for solar-radiation error. The magnitude of the temperature correction is a function of reported temperature, while the height adjustment varies linearly with the temperature correction.

Rawinsonde data utilized for the 5-mb charts were processed by computer methods. Inputs to the computer program consisted of observations from North America and adjacent ocean areas for the 7-, 5-, 4-, and 3-mb levels in the form of punched cards obtained from the National Weather Records Center. Output listings included all observations for 1 week at each station. Data for levels other than 5 mb were also listed to supply the analyst with as much supplementary information as possible. Thermal winds and corresponding horizontal temperature gradients were computed for the layers from 7 to 5, 7 to 4, and 5 to 4 mb.

After processing, the rawinsonde-derived temperature, height, wind, and thermal wind were plotted on working charts. For charts presented in this publication, the rawinsonde data have been omitted for the sake of legibility.

PROCESSING OF ROCKETSONDE DATA

Winds and temperatures measured by rocketsonde systems comprised the basic data sample for analyses at the 2- and 0.4-mb levels, and were also used in combination with rawinsonde data for the 5-mb charts. The rocketsonde information was obtained for this project in the form of magnetic tape, identical in format to published information contained in the *Meteorological Rocket Network* (MRN) *Firings* (World Data Center A 1968).

The procedure for extraction of rocketsonde information and for computation of heights of the 5-, 2-, and 0.4-mb surfaces was as follows:

a. Wind and temperature profiles were processed by a computer program, designed to reduce the amplitude of rapid oscillations in the vertical by using a simple (1-2-1) smoothing technique. This processing was done because analyses are intended to portray only the broad-scale stratospheric features.

b. Temperatures were modified above 40 km in accordance with Drews' (1966) publication, one of several recent theoretical studies (see the review article by Ballard 1967). For the Arcasonde 1A, the instrument most widely employed during 1967, the correction applied to the temperature profiles assumed a representative fall rate and increased from 1°C at 42 km to about 9°C at 58 km.

c. An initial estimate of the geopotential height for each station at the respective pressure levels (5, 2, and 0.4 mb) had to be made before the temperature for that particular level could be selected. This estimate was obtained by deriving the temporal trend of the geopotential height for the station from the lower level analyzed charts and by applying this trend to the geopotential height for the station as shown by the previously analyzed chart. The temperature at this estimated height was then extracted from the temperature profile.

d. The true geopotential height of the pressure surface at each station was then hydrostatically computed for each available temperature profile. This height was obtained by deriving a layer-mean temperature between the extracted temperature of the upper level and the temperature obtained from the previously completed lower level analysis. For the 5- and 2-mb levels, a linear lapse rate was assumed to be representative. Because a temperature maximum (associated with the stratopause) usually exists between 2 to 0.4 mb, mean temperatures were derived by using values extracted at each whole kilometer between the two pressure levels.

e. Wind components were extracted from the smoothed profiles at the height of the constant-pressure surface, and a resultant wind was computed.

f. Thermal winds were determined for 6-km layers surrounding each pressure surface at the reporting station. An experimental method of smoothing the wind profiles was used to derive thermal winds for the January and February analyses. This method of fitting a first-, second-, or third-order polynomial to the data proved quite useful for eliminating scales of motion smaller than those being analyzed and led to generally consistent computations of the horizontal temperature gradients.

The rocketsonde data derived (temperature, height, wind direction and speed, and thermal wind) were plotted on working charts. On the charts presented for publication, three observations are shown when available for each station. Heights and thermal winds have been omitted for the sake of legibility. The Station Model and Reporting Rocket Stations chart illustrates the symbols used to distinguish the data obtained on Wednesdays from off-time data.

ANALYSIS PROCEDURE

Conventional techniques, including differential analysis methods, were utilized to construct the 5-, 2-, and 0.4-mb charts. However, because of the sparsity of observations, data acquired for the entire week were examined to determine the synoptic changes that took place during the week, and thus conditions pertaining to Wednesday.

The analysis system consisted of the following steps:

a. Isotherms were derived with the aid of processed rocketsonde and rawinsonde temperatures. In spite of the corrections applied to the 5-mb rawinsonde temperature data, large differences could sometimes be seen when comparing rocketsonde data that were close in time and distance. Generally, the problem could be resolved by giving greater weight to rawinsonde stations employing hypsometers. In a few cases, the difficulty even occurred with hypsometer radiosondes; therefore, some compromise value had to be chosen, usually closer to the rocketsonde-reported temperature. Computed thermal winds were especially useful in determining horizontal temperature gradients and the relative location of warm and cold areas. Where possible, time-height sections of temperature were plotted as a further aid in deriving the isotherms.

b. A mean temperature field representative of the layer between the previously analyzed lower surface, and the selected surface was derived graphically. This mean field represents a geopotential thickness which, when added to the lower level height field, yields a smooth, conservative first approximation to the contour pattern at the upper surface.

c. Reported winds and computed heights for individual stations were then used to adjust the first approximation of the contour field, using the assumption of geostrophic flow. Winds were accorded the highest priority for this adjustment.

d. The analysis was checked for vertical and temporal consistency. For example, centers of systems, ridges, and troughs were examined with the aid of all available data to verify vertical slope and movement with time. Time-height sections and height-change charts were especially useful for these purposes.

The above procedures appear to produce excellent results at 5 mb, and were successfully applied to obtain the 2- and 0.4-mb charts. Generally, only slight adjustments of the first-approximation height fields were necessary at the 5- and 2-mb levels. However, rather formidable analysis problems were evident at the 0.4-mb level. Obviously, the most severe problems arise from the sparsity of observations. The geographical area of analysis for the charts has thus been reduced in accordance with the available data. Another difficulty was the apparent occurrence of large day-to-day temperature changes at times exceeding 10°C (Miller 1969), and persistent oscillations in many wind profiles. In some cases, deviations of reported temperatures and winds from the fields derived by differential analysis techniques could be accounted for by identifiable synoptic changes. Occasionally, it was impossible to make a reasonable reconciliation of station values with the values determined by differential analysis.

A further analysis problem arises from the apparent intersection of the stratopause with the 0.4-mb level. Because the normal stratospheric temperature inversion ceases at the stratopause level, the graphical method for obtaining mean temperature, which depends on the existence of a linear profile, is no longer valid. Large adjustments must be made, especially at lower latitudes, in the graphically derived height field to conform with the computed height at each station (as discussed in the previous section).

An additional problem is encountered in the summer charts. During that season, the circulation at the upper surfaces (2 and 0.4 mb) would be expected to follow the pattern established for lower levels, that is, a rather uniform easterly flow about an anticyclone centered at or very near the North Pole. However, on a typical summertime 0.4-mb chart, most reported rocketsonde winds exhibit significant southerly components. If these winds were to be given full weight in the analysis, the resulting pattern would consist of contours, oriented from southeast to northwest, spiraling toward a high center located apparently over northern Europe.

The prevalence of positive meridional components in summertime rocketsonde winds has been noted previously (Miers and Beyers 1964). Recent studies (Reed et al. 1966), based on MRN data for several summers have demonstrated that the meridional wind component resulting from the diurnal tide reaches maximum southerly strength at about noon, local time. Since most MRN firings occur near local noon, the measured winds naturally contain this component. Although no adjustments were made in individual reports, the analysis procedure includes suitable compensation. Differences in the reported winds and orientation of the contours may be quite pronounced, especially on the summertime charts. Strong westerly winds of winter usually mask the weak diurnal component, but there is a possibility that this component may contribute to some bias in analysis during periods of weak circulation.

Although careful consideration of high-level data allows a broad-scale depiction of circulation patterns up to 0.4 mb, the sparsity of reports requires an increasing amount of subjectivity as the analysis proceeds to this high level. As yet, the analyst has little in the way of synoptic models for guidance with respect to the probable contour and isotherm patterns and the phase relationship between these patterns in areas of sparse data. The justification for some analyses depends on the interpretation of the limited amount of data in such a way as to portray a coherent sequence of synoptic events. In spite of these factors, surprisingly little alteration in the principal features of the circulation and temperature distribution shown in the final analysis can be made without inordinately violating some of the data. In general, the contours and isotherms depicted are felt to be good approximations to the flow patterns at these levels. Even so, the same degree of accuracy that is found customarily in the analysis of charts at lower levels should not be expected.

A contour interval of 320-geopotential meter (gpm) was used throughout the year. In addition, intermediate dashed contours were used to outline areas of relatively weak gradient, especially during the spring and fall changeover periods. Isotherms were drawn and labeled at 5°C intervals.

DISCUSSION OF THE 1967 CHARTS

The principal features of the circulation during 1967 may be seen in figures 1 through 5 which illustrate the analyzed height and temperature values extracted from the weekly charts at the location of five representative rocket launch sites. From these figures, we can see the large changes that occurred and also infer the cycle of events during the course of the year. The annual trend toward maximum height and temperature during the summer and toward minimum during the winter is clearly visible in figures 1 through 4. Largest ranges in values are seen at the more northerly locations. The pronounced sinusoidal temperature curves, most noticeable at 5 mb, are considerably flattened at 0.4 mb (Johnson and Gelman 1968). Although not clearly shown by this graph, Antigua, B. W. I. (fig. 5), exhibits the semiannual variation associated with a tropical station. The major anomalies of the winter period are seen in the curves as these disturbances affect the various locations. Outstanding departures from the seasonal trend occurred in January when a minor warming affected the upper stratosphere, and in December when the first indications of a major stratospheric warming could be seen. Perturbations seen in February, March, and November were associated with the intensification and movements of the Aleutian anticyclone, with events in April leading to the final spring change to summer conditions.

The following discussion will concentrate on a brief description of the major synoptic events of 1967 and will show how the charts depict them.

In January, the circulation was dominated by a cold cyclone near the North Pole with anticyclonic activity apparent in the Aleutian region and the western Atlantic Ocean. The isotherm patterns, especially at 2 and 0.4 mb, were not oriented parallel to the contours, suggesting that strong dynamic changes were taking place.

As an aid to the readers, it may be instructive to review the various segments of information used by the analyst to determine the circulation features on typical charts; for example, the January 4 charts. The basic isotherm pattern at 5 mb was determined by several rocketsonde reports at each station and by the approximately three times as many radiosonde reports received from stations located primarily on the North American continent. Off-time reports were used as an aid in determining conditions shown in the analysis.

In addition to the cold trough extending from Greenland over western Canada to the mid-Pacific, two warm areas were also apparent. A report from Bermuda, together with thermal wind reports from Wallops Island, Va., and Cape Kennedy, Fla., indicated the location of warm air off the U.S. east coast. Another warm area in eastern Siberia was determined largely on the basis of the computed thermal winds at Fort Greely, Alaska. This latter location, however, agrees well with analyses at lower levels where more data were available. The contours were then determined, with very little adjustment needed, in accordance with the method previously discussed. It is apparent that all available data fit into a coherent pattern for the determination of the temperature and height field at 5 mb.

At the 2- and 0.4-mb levels, only rocketsonde data were available, so that added emphasis had to be placed on the thermal winds to outline the temperature fields. The thermal winds indicated a sharp constriction of the cold trough between the warm centers, with a system of cold air over the Gulf of Alaska and another in the polar regions. The very strong thermal gradients shown on these charts may have been difficult to justify solely on the basis of the single cold report at Fort Greely on January 3 and from the computed thermal winds. However, substantiating evidence appeared the following week when rapid temperature changes were reported by all western stations. This reinforced the pattern of intense cold and warm centers which moved rapidly during the period.

The situation up to this point strongly suggested that a major stratospheric warming would take place. Warming was noted over the North Atlantic Ocean and the Alaskan region; the contour and isotherm patterns appeared to be oriented in a hemisphere pattern of wave two (two warm anticyclones diametrically opposed and an elongated polar low with isolated cold air in the middle latitudes). In spite of the intense temperature changes at the upper stratospheric levels, the temperature fields below 5 mb were relatively unaffected. Because the height fields were only slightly changed and westerly circulation remained strong, this event in January was termed a minor stratospheric warming.

During the last half of February, a significant circulation change occurred as the Aleutian anticyclone moved eastward over western North America. Warm air associated with this system was detected northeast of the center. By March 22, the anticyclone had receded to lower latitudes while warm air had moved steadily toward the polar basin. This latter movement resulted in a reversal of thermal gradient by the end of March—warm air dominated the North Pole and relatively cold air was located in the midlatitudes. The height field slowly responded to the thermal changes, but westerly circulation remained evident until the second week in April. At that time, the anticyclone redeveloped in the Aleutian region, moved over Alaska, and gradually displaced the polar cyclone. As the warm polar anticyclone intensified in response to the springtime radiational changes, the westerlies associated with the cold trough moved southward. By the beginning of May, the westerlies had disappeared at 0.4 mb; at the end of the month, easterlies were predominant over the entire analysis area.

While the higher latitudes of the Northern Hemisphere were under the influence of circumpolar easterlies which increased in intensity with altitude, the light and variable winds at Fort Sherman, C. Z., indicated a more cellular structure in the tropical latitudes. This structure can be explained at least in a qualitative way partly as the coupling mechanism between the dominant easterlies of the Northern Hemisphere and the westerlies of the Southern Hemisphere (Miller and Finger 1969).

The warm summertime polar anticyclone reached maximum temperature and intensity at the beginning of July. Thereafter, this system began a slow decay as solar radiation over the northern latitudes declined. By August 23, a cold core cyclone had formed near the North Pole at 5 mb. This system gradually intensified, displacing the remnants of the polar anticyclone (in the form of cellular ridges) southward. By the second week of September, easterly winds were still apparent at the middle latitudes, but general circulation features were relatively complex. For instance on September 27, the westerlies at 2 mb, as reported by Fort Sherman, indicated a trough was north of the station, as were the dominant cyclone and subtropical ridge. At 5 mb and 0.4 mb, however, this tropical trough was south of the station.

The polar region cooled and the vortex intensified in October, producing a stable-appearing circumpolar westerly circulation. At 0.4 mb, however, the cooling in polar regions was interrupted by relatively warm air in the region north of Fort Greely. Charts for other periods have shown rather clearly that temperature variations may occur in the upper stratosphere without any significant change in the parameter even at middle stratospheric altitudes. It was not until the middle of November that the entire layer from 5 to 0.4 mb was affected.

On December 6, the very warm report from Fort Greely at 0.4 mb may have been an indication of the major stratospheric warming that occurred during the following weeks (Johnson 1969). Rapid movement in the temperature pattern occurred so that by December 13, warm temperatures were reported at West Geirinish, Scotland, and Cape Kennedy, and the calculated thermal winds at all eastern stations indicated that at 0.4 mb there was a very large area of the Northern Hemisphere under the influence of warm air. This rapid change becomes more evident when viewed in the context of the sequence of events at lower levels. The warm air seen in the eastern Atlantic region, for instance at 5 mb on December 20, was part of a large warm area around Eurasia, extending sometimes to Alaska. Relatively small position changes in this warm area, with the warm air extending into the Aleutian region one time and into the North Atlantic region the next, could have accounted for the rather radical change apparent at 0.4 mb from December 6 to December 13.

Very strong gradients in the height field were also seen during this time period, with a wind of over 350 knots at the 47-km level reported on December 13 at West Geirinish. During succeeding days, the effects of the warming were observed at lower altitudes. By December 20, a very warm region was seen at 5 mb over Europe, with rapidly intensifying anticyclones in the Atlantic and western Pacific Oceans. Warming in some areas was as much as 70°C during that week. The Atlantic anticyclone moved northward as the warm area expanded and intensified. By the end of December, the temperature gradient between the polar latitudes and midlatitudes had reversed throughout the entire middle and upper stratosphere. This remarkable event constituted the earliest (by about a month) major warming of the stratosphere ever recorded. Consequences of this stratospheric warming carried into the beginning of the following year, with major circulation changes occurring in January 1968. (This discussion prepared by Melvyn E. Gelman.)

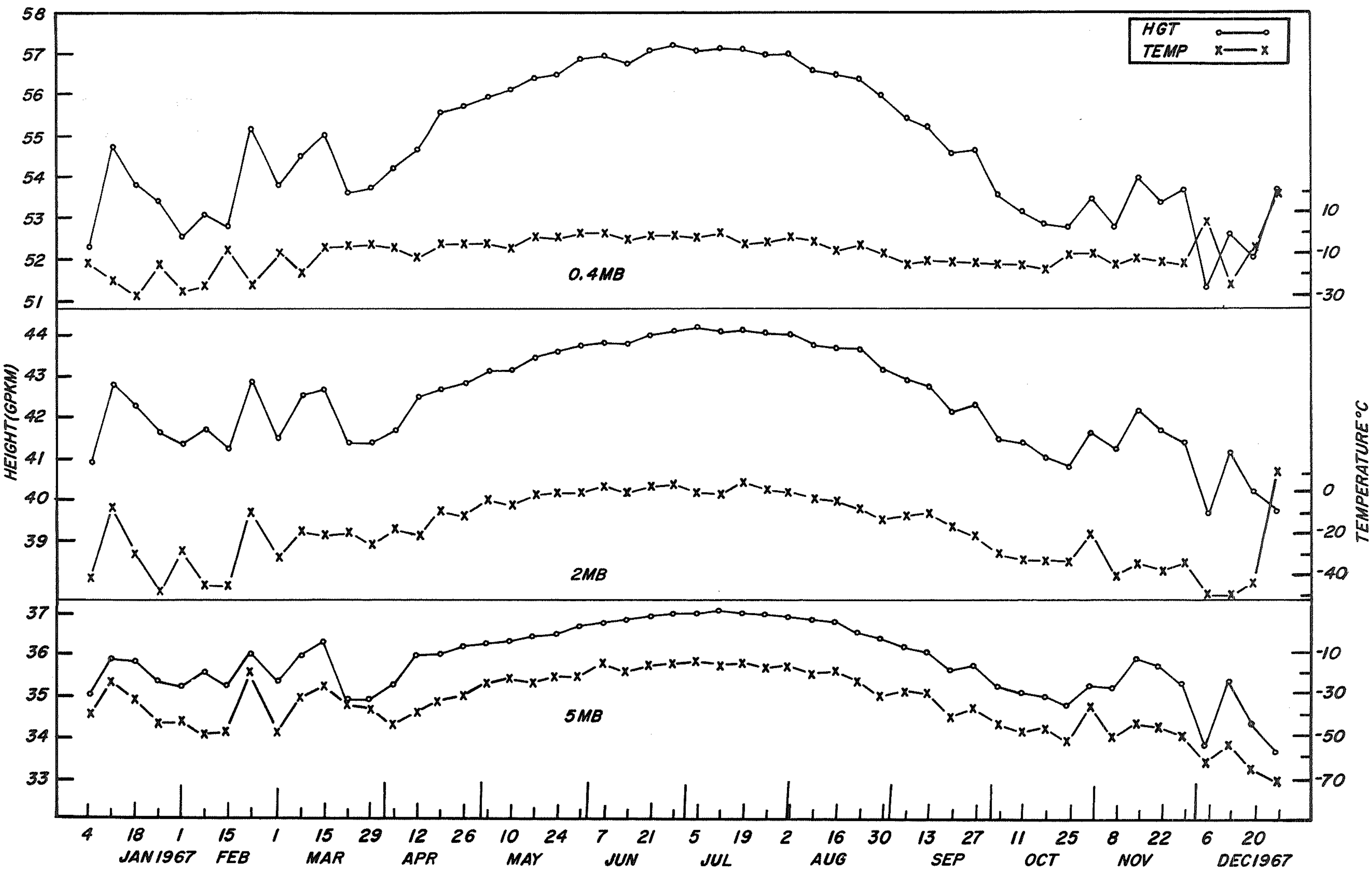

FIGURE 1.—Fort Greely, Alaska (64°00′N.,145°44′W.), analyzed values extracted from weekly 5-, 2-, and 0.4-mb charts.

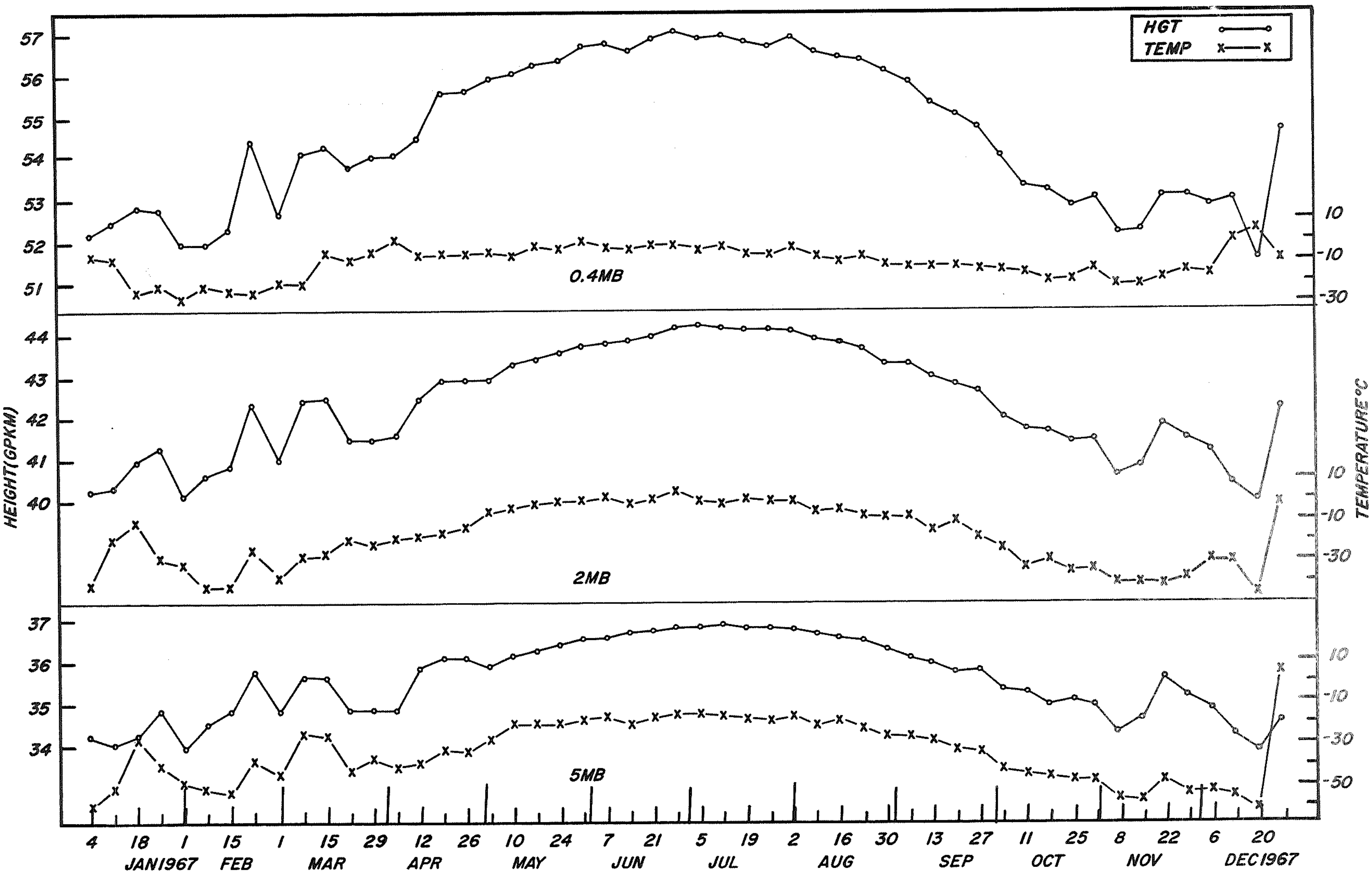

FIGURE 2.—Fort Churchill, Canada (58°44′N.,93°49′W.), analyzed values extracted from weekly 5-, 2-, and 0.4-mb charts.

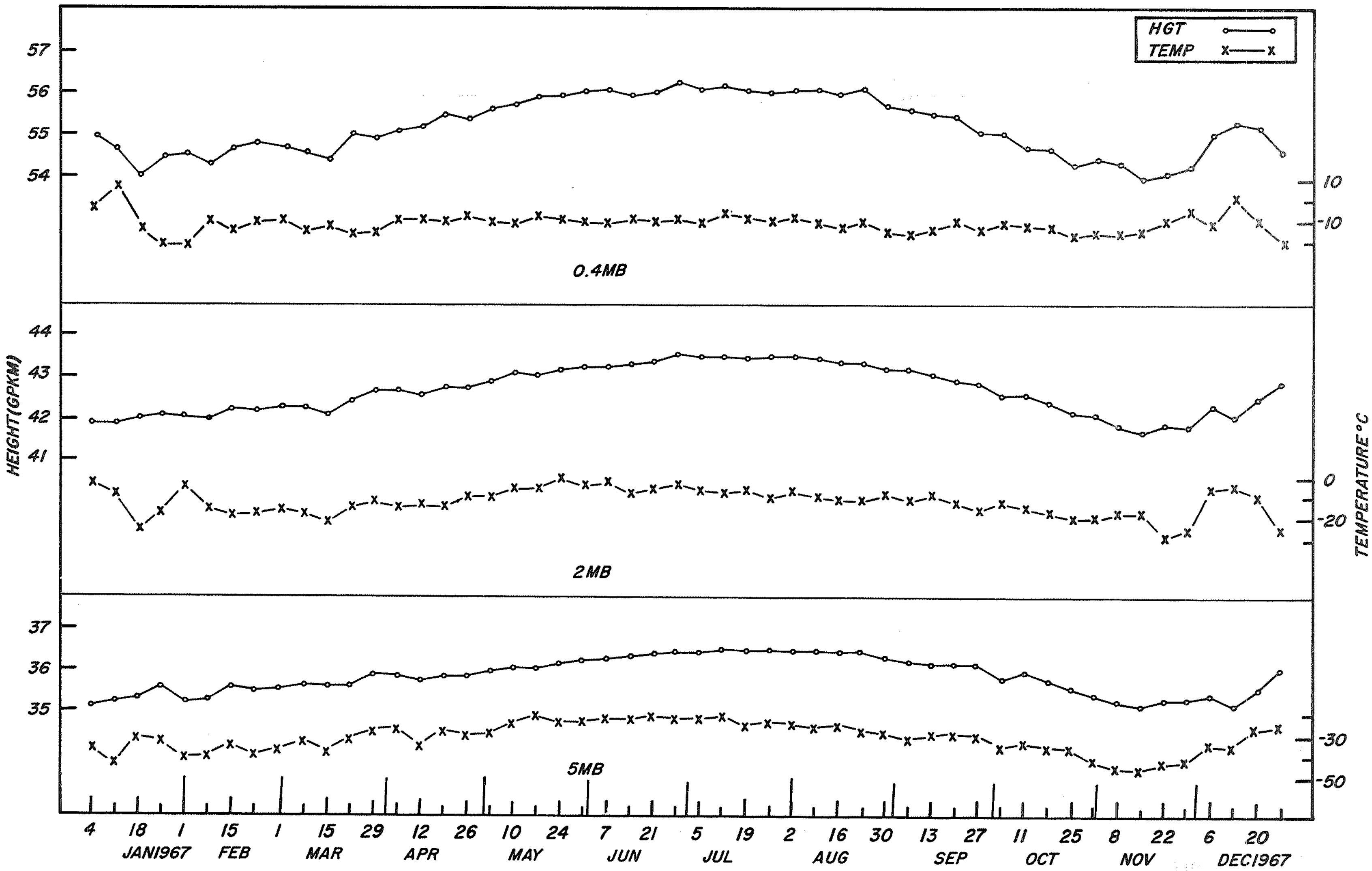

FIGURE 3.—Wallops Island, Va. (37°50′N., 75°29′W.), analyzed values extracted from weekly 5-, 2-, and 0.4-mb charts.

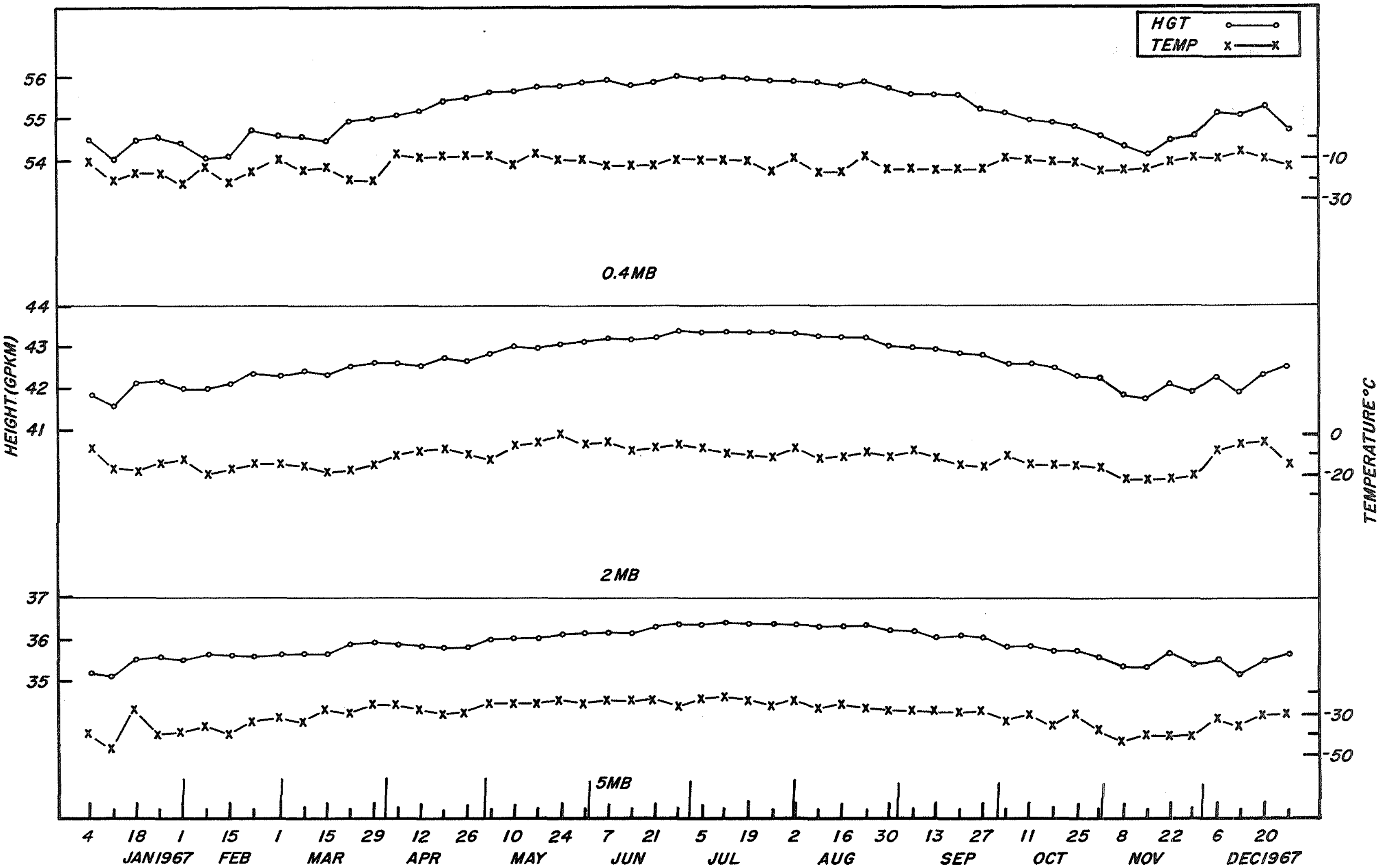

FIGURE 4.—White Sands, N. Mex. (32°23′N., 106°29′W.), analyzed values extracted from weekly 5-, 2-, and 0.4-mb charts.

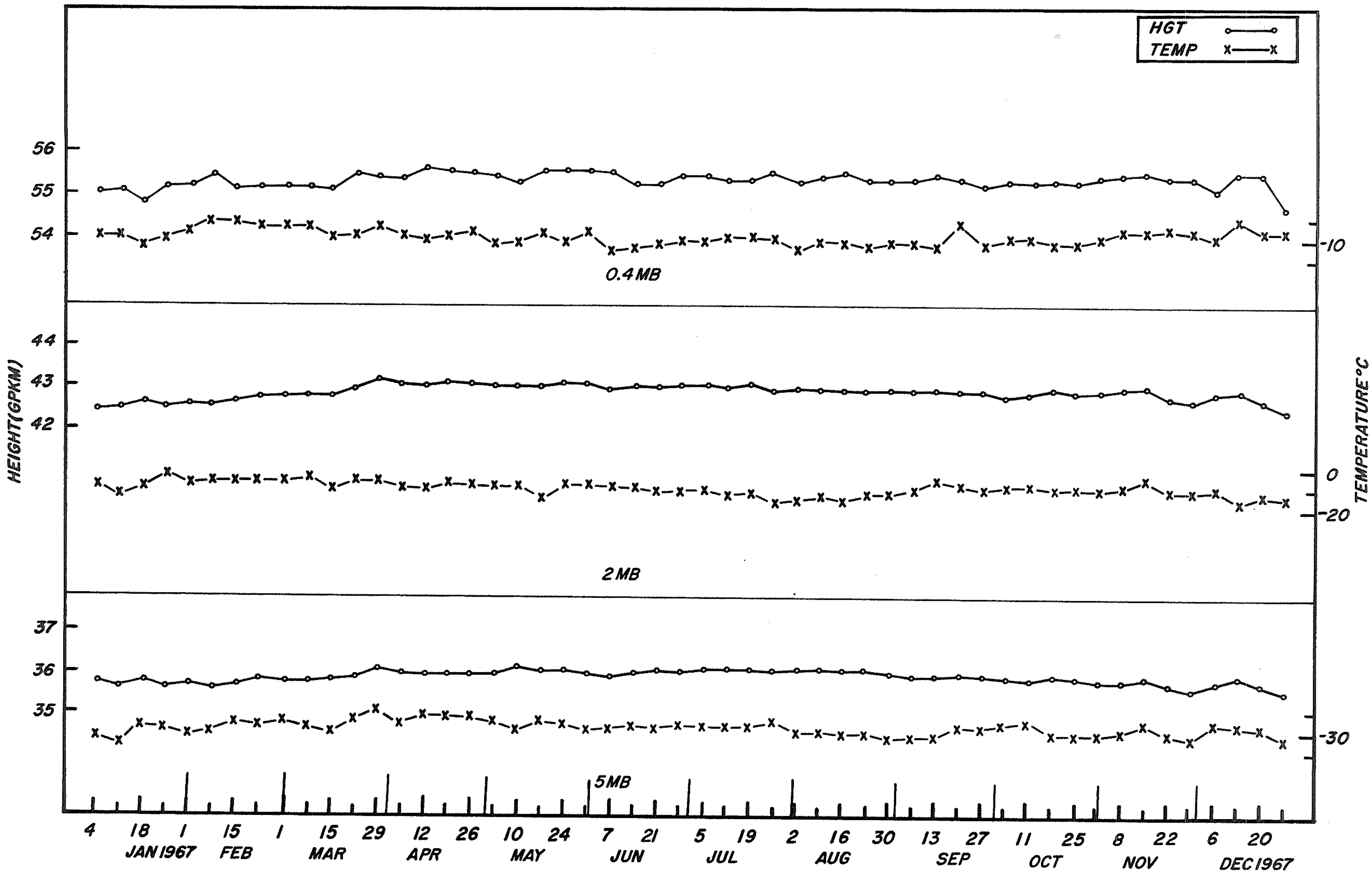

FIGURE 5.—Antigua, B.W.I. (17°09′N.,61°47′W.), analyzed values extracted from weekly 5-, 2-, and 0.4-mb charts.

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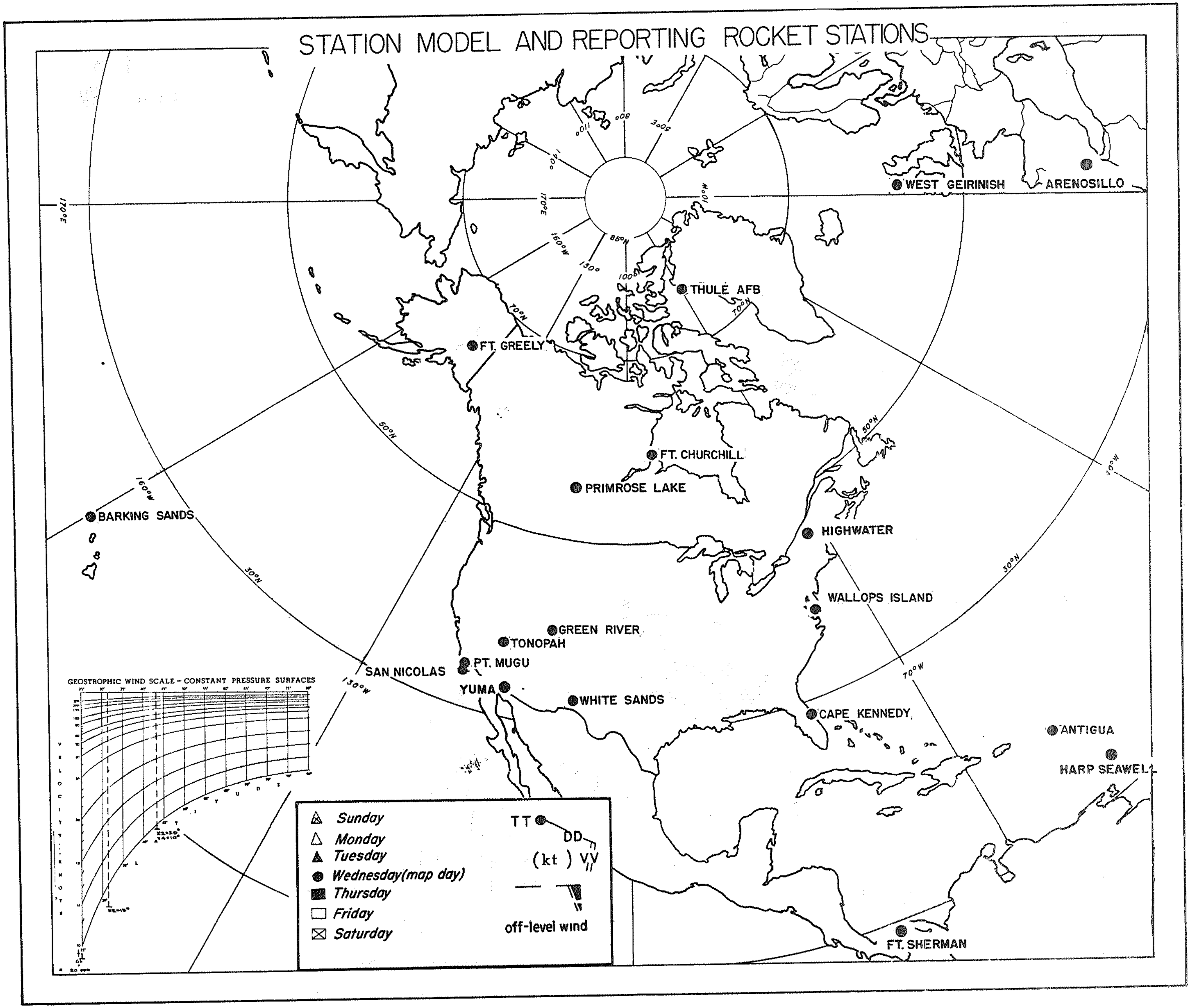
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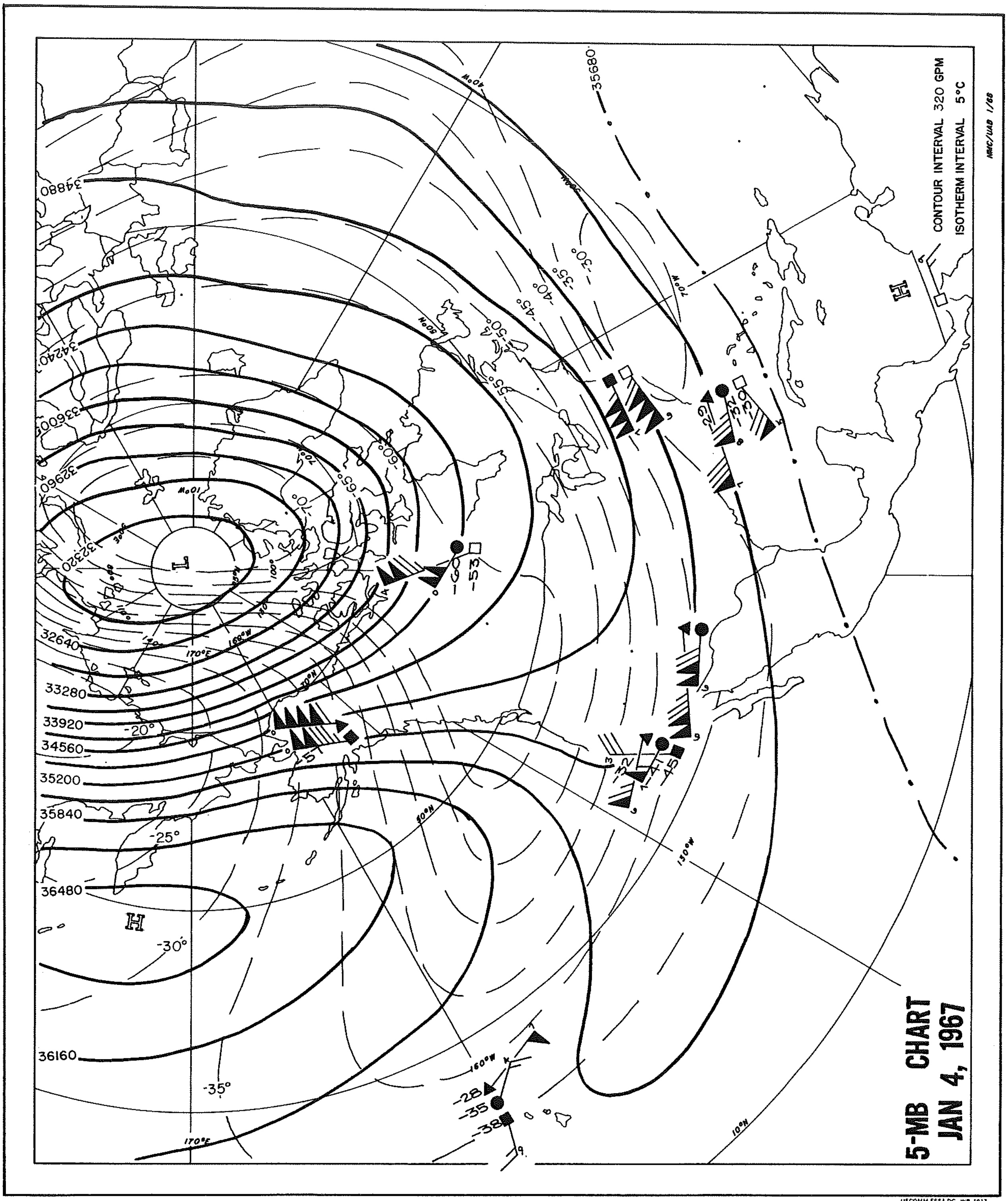
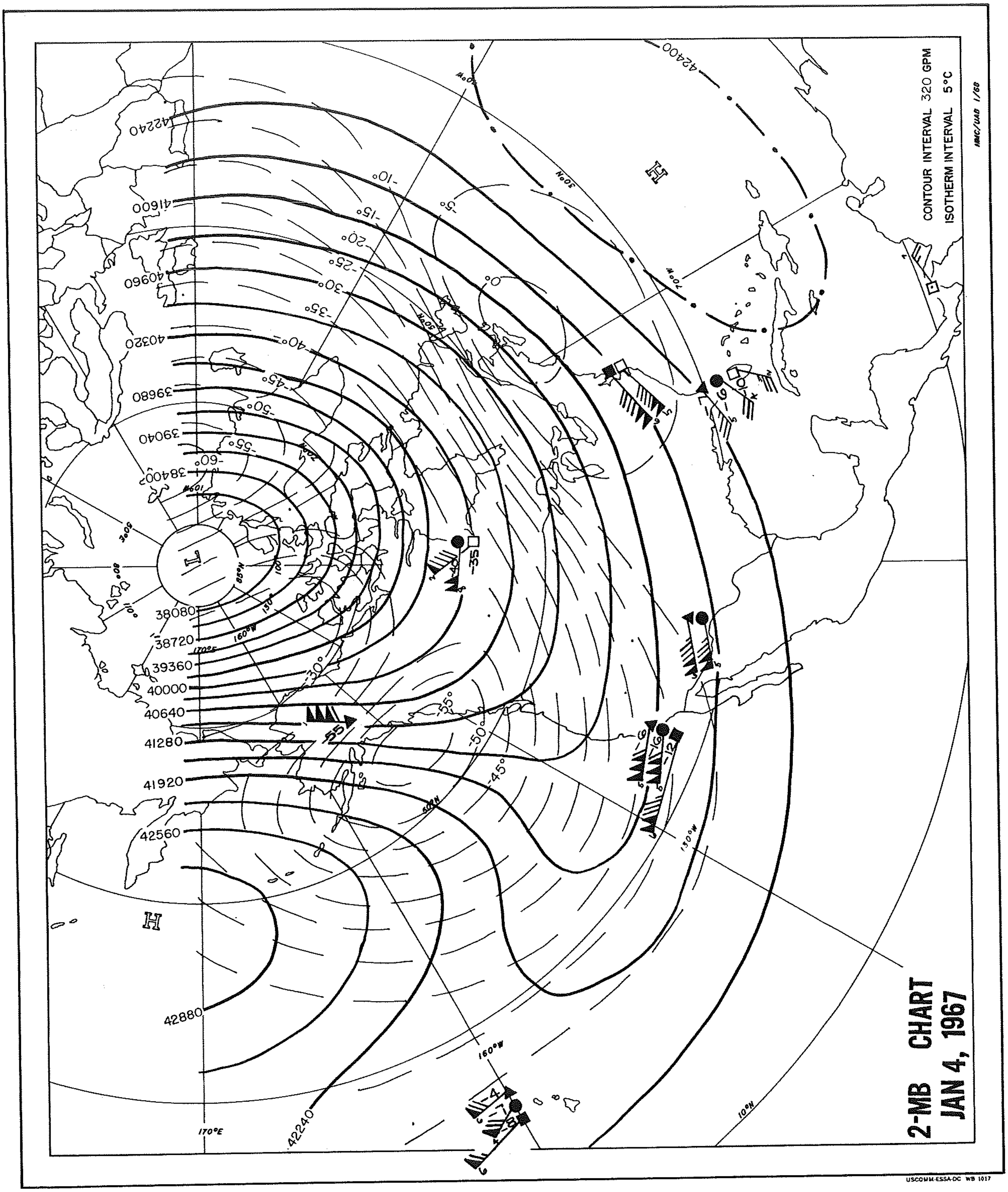
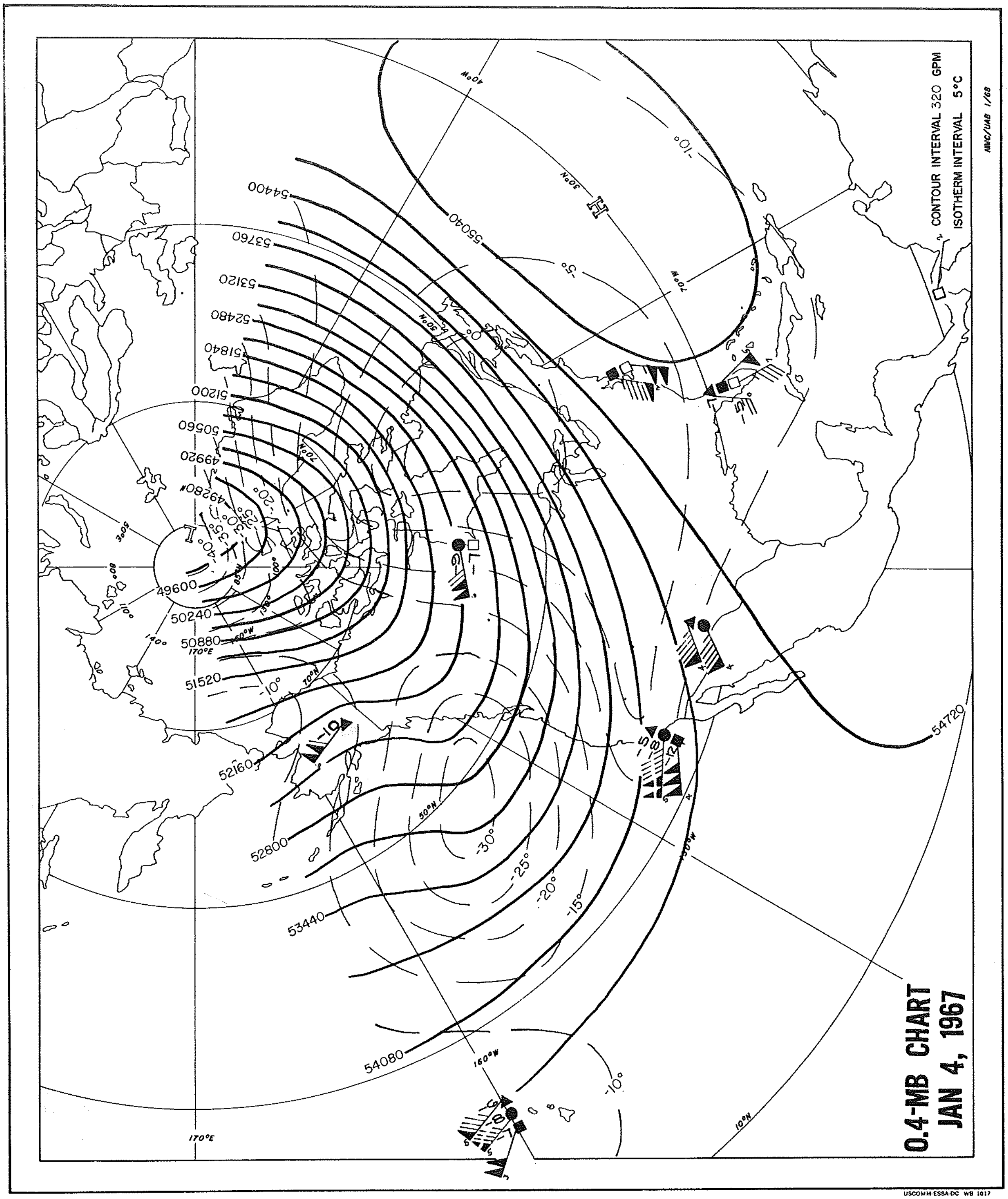
FT. CHURCHILL
PRIMROSE LAKE
BARKING SANDS
HIGHWATER
WALLOPS ISLAND
GREEN RIVER
TONOPAH
PT. MUGU
SAN NICOLAS
YUMA
WHITE SANDS
CAPE KENNEDY
ANTIGUA
HARP SEAWELL
FT. SHERMAN
GEOSTROPHIC WIND SCALE - CONSTANT PRESSURE SURFACES
Sunday
Monday
Tuesday
Wednesday(map day)
Thursday
Friday
Saturday
TT
DD
(kt)
VV
off-level wind
170°E
160°W
130°W
70°W
10°W
50°E
80°
110°
140°
170°E
160°W
130°
100°
85°N
70°N
50°N
30°N

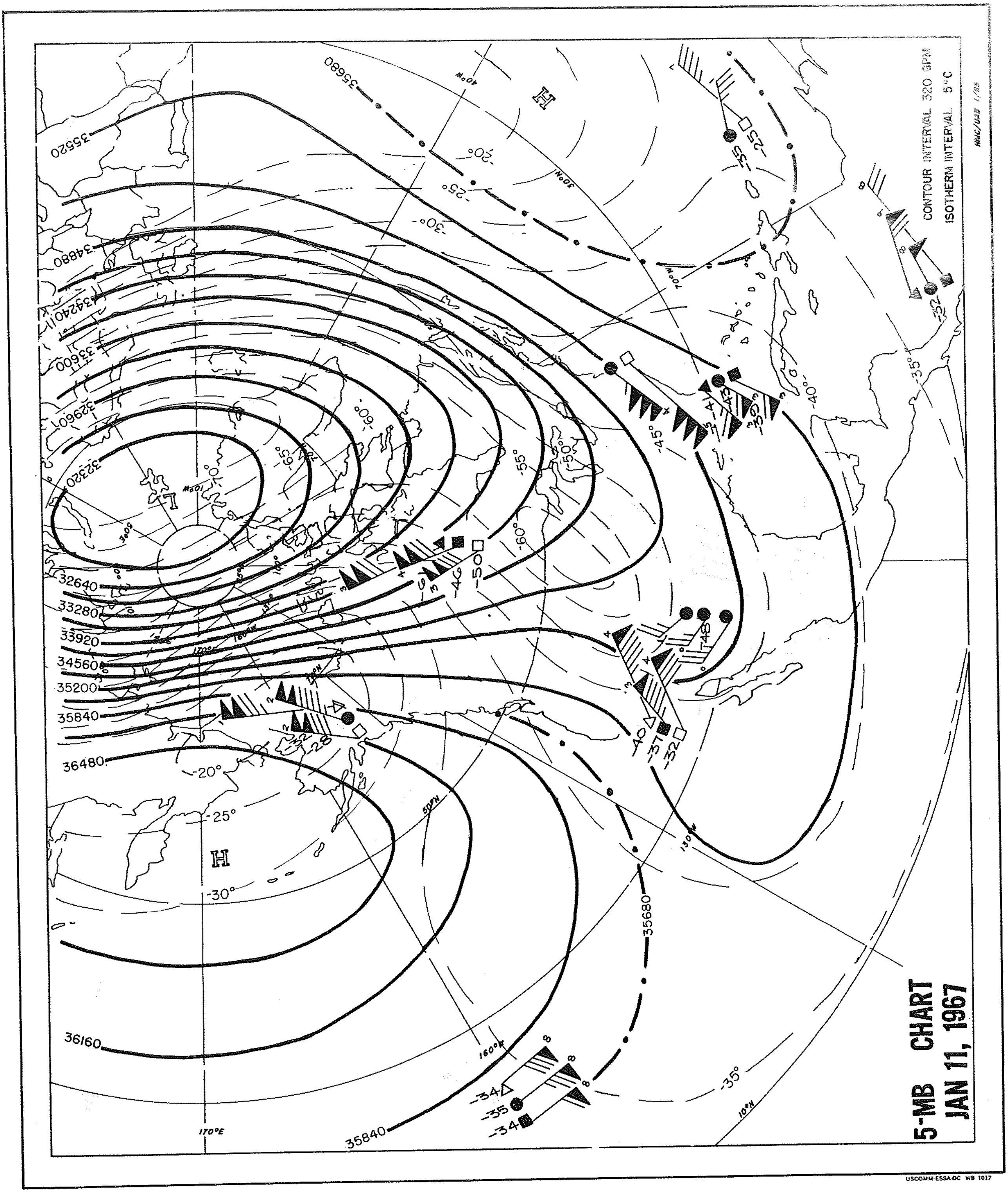


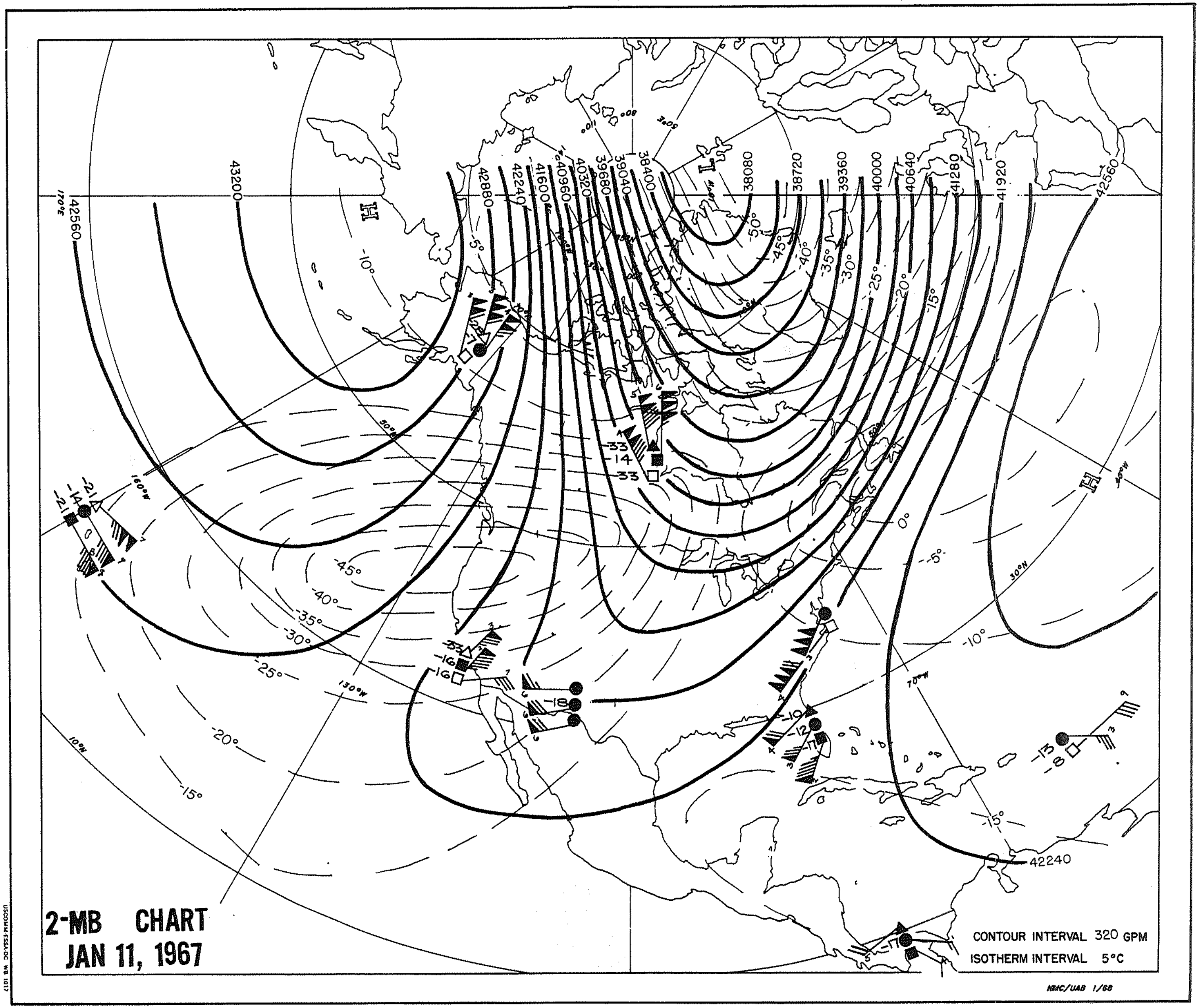
USCOMM-ESSA-DC WB 1017

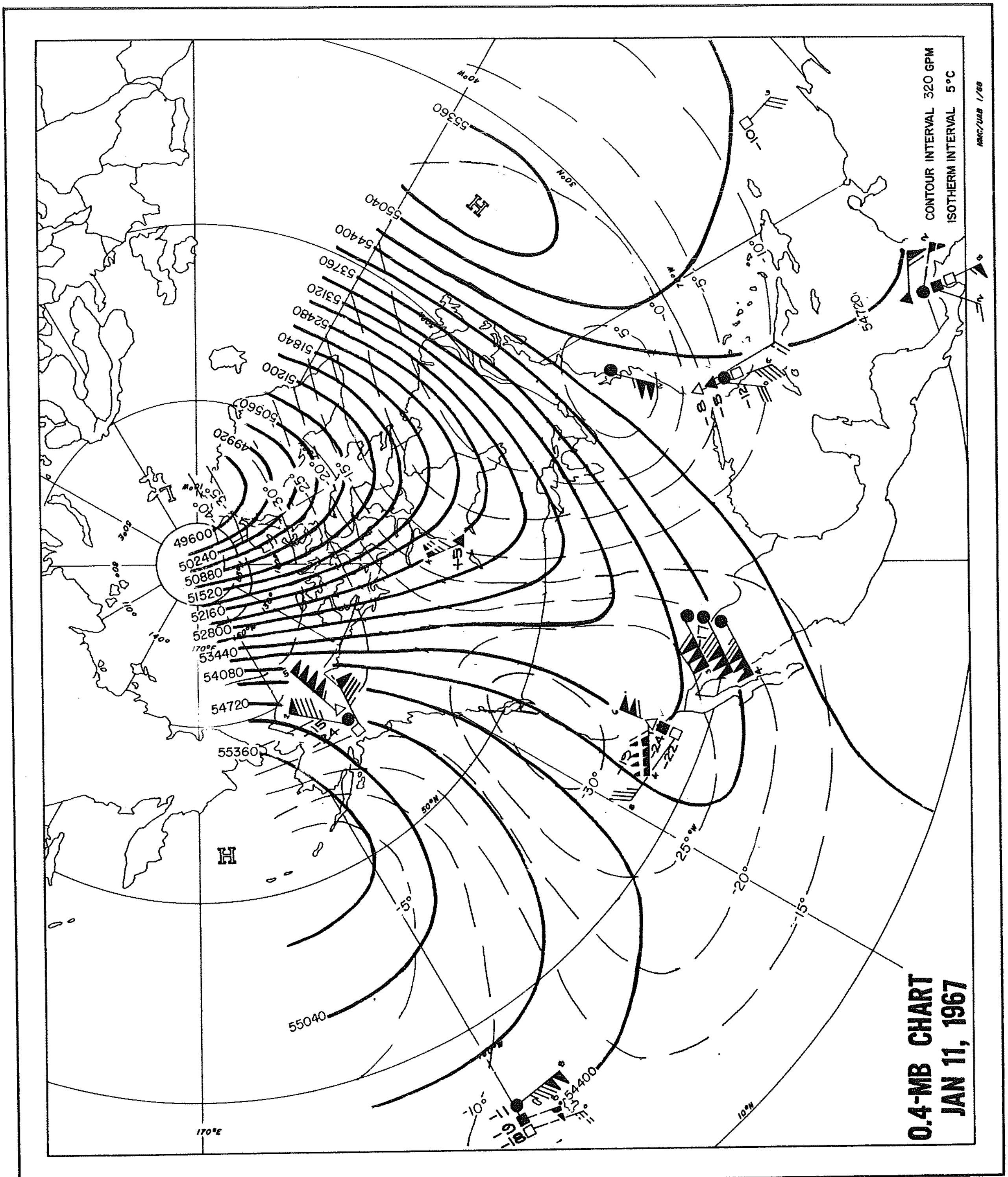

2-MB CHART
JAN 4, 1967
CONTOUR INTERVAL 320 GPM
ISOTHERM INTERVAL 5°C
42240
41600
40960
40320
39680
39040
38400
38080
38720
39360
40000
40640
41280
41920
42560
42880
42240
42400
H
L
H
USCOMM-ESSA-DC WB 1017



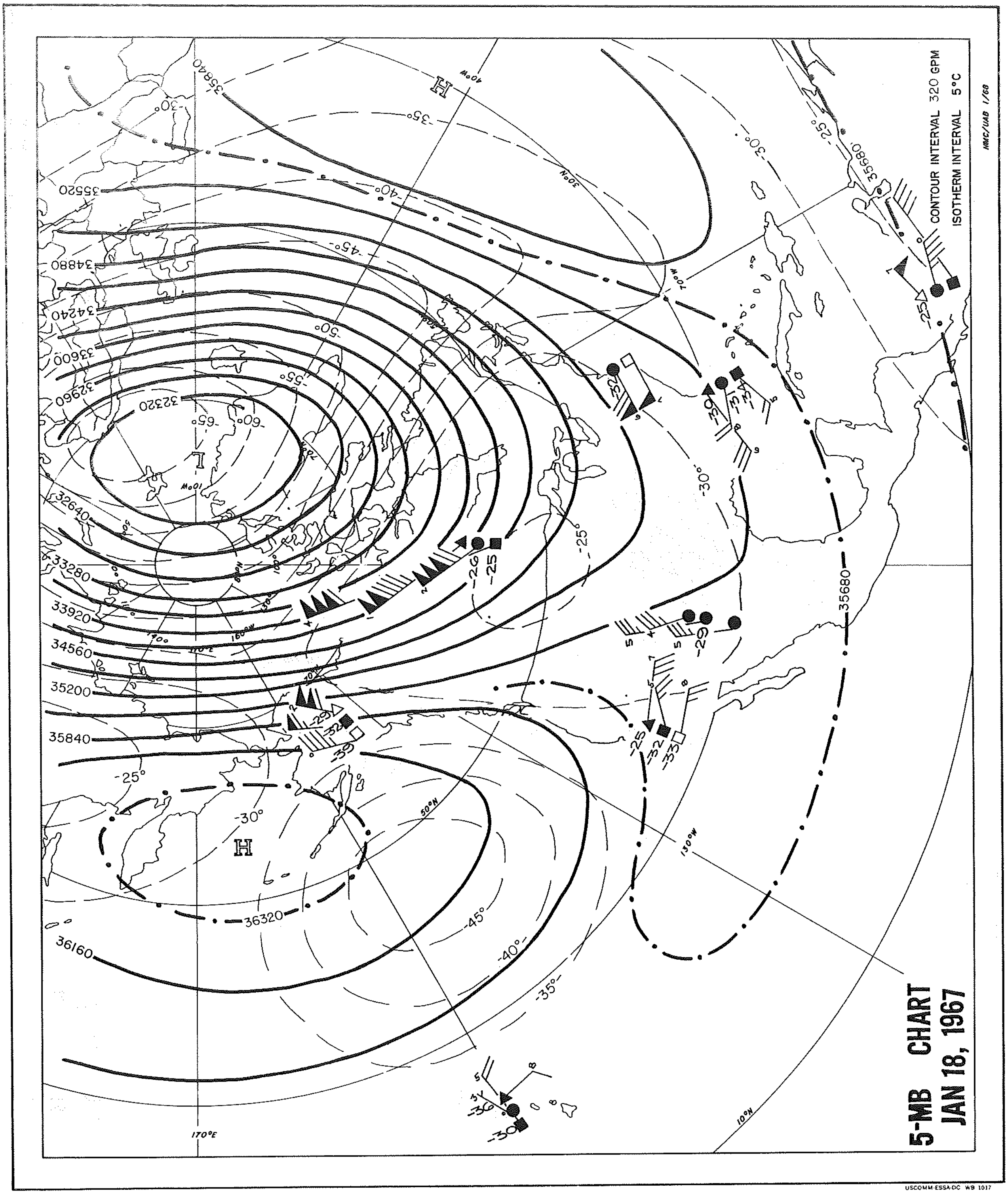
USCOMM-ESSA-DC WB 1017

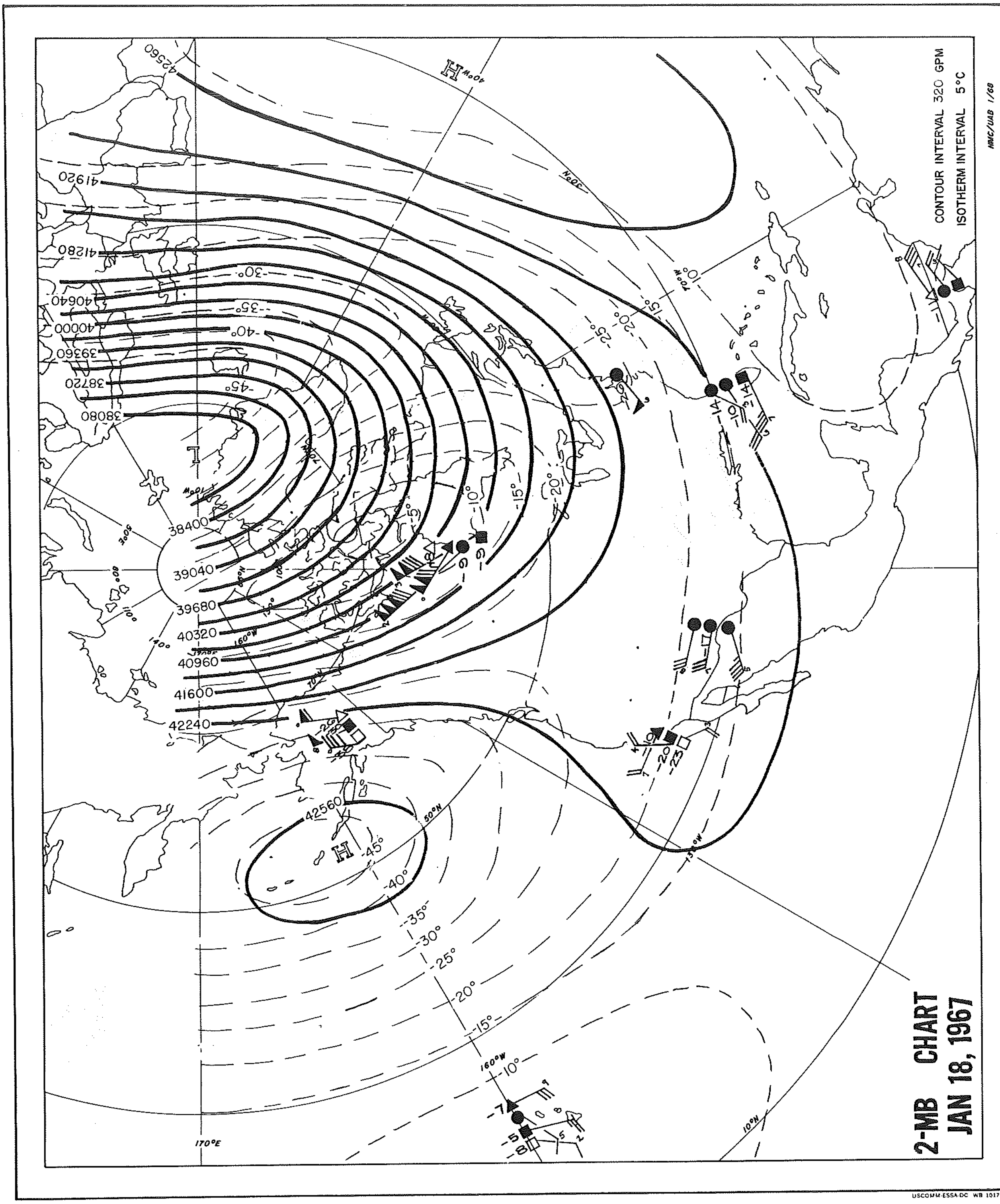

5-MB CHART
JAN 11, 1967
CONTOUR INTERVAL 320 GPM
ISOTHERM INTERVAL 5°C
32640
33280
33920
34560
35200
35840
36480
36160
35840
35680
USCOMM-ESSA-DC WB 1017


2-MB CHART
JAN 11, 1967
CONTOUR INTERVAL 320 GPM
ISOTHERM INTERVAL 5°C
NMC/UAB 1/68

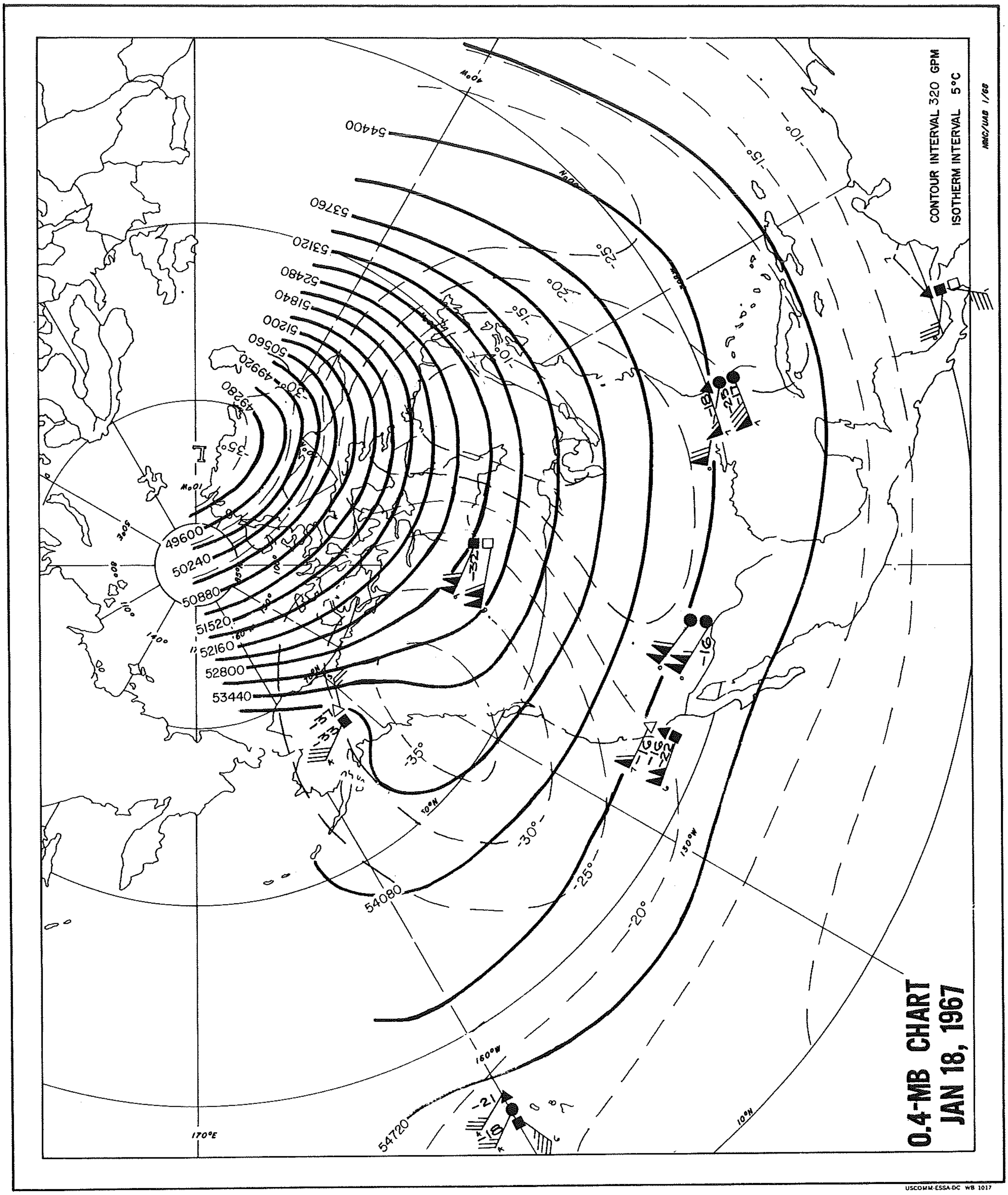


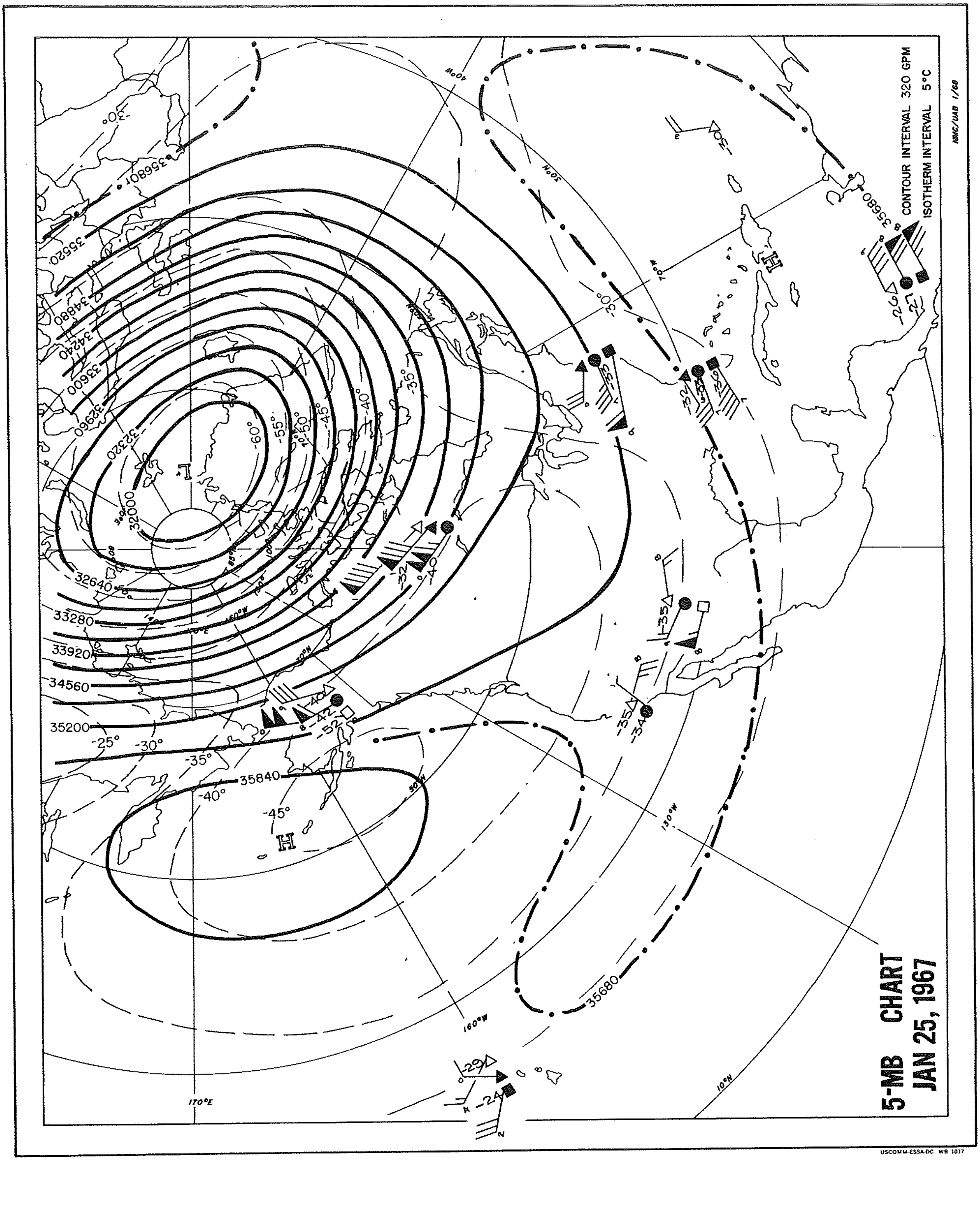
0.4-MB CHART
JAN 11, 1967
CONTOUR INTERVAL 320 GPM
ISOTHERM INTERVAL 5°C
USCOMM-ESSA-DC WB 1017

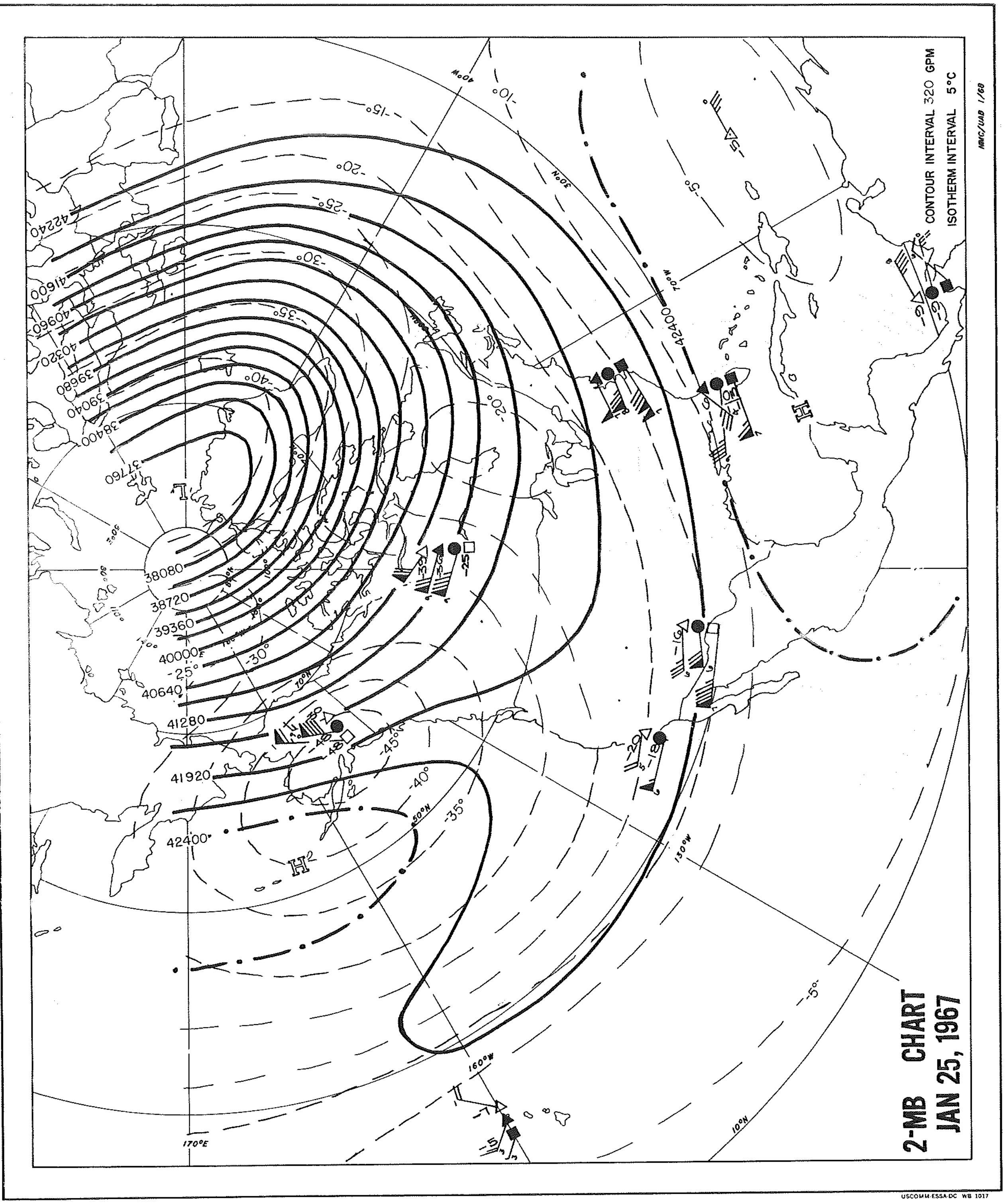

5-MB CHART
JAN 18, 1967
CONTOUR INTERVAL 320 GPM
ISOTHERM INTERVAL 5°C
USCOMM-ESSA-DC WB 1017



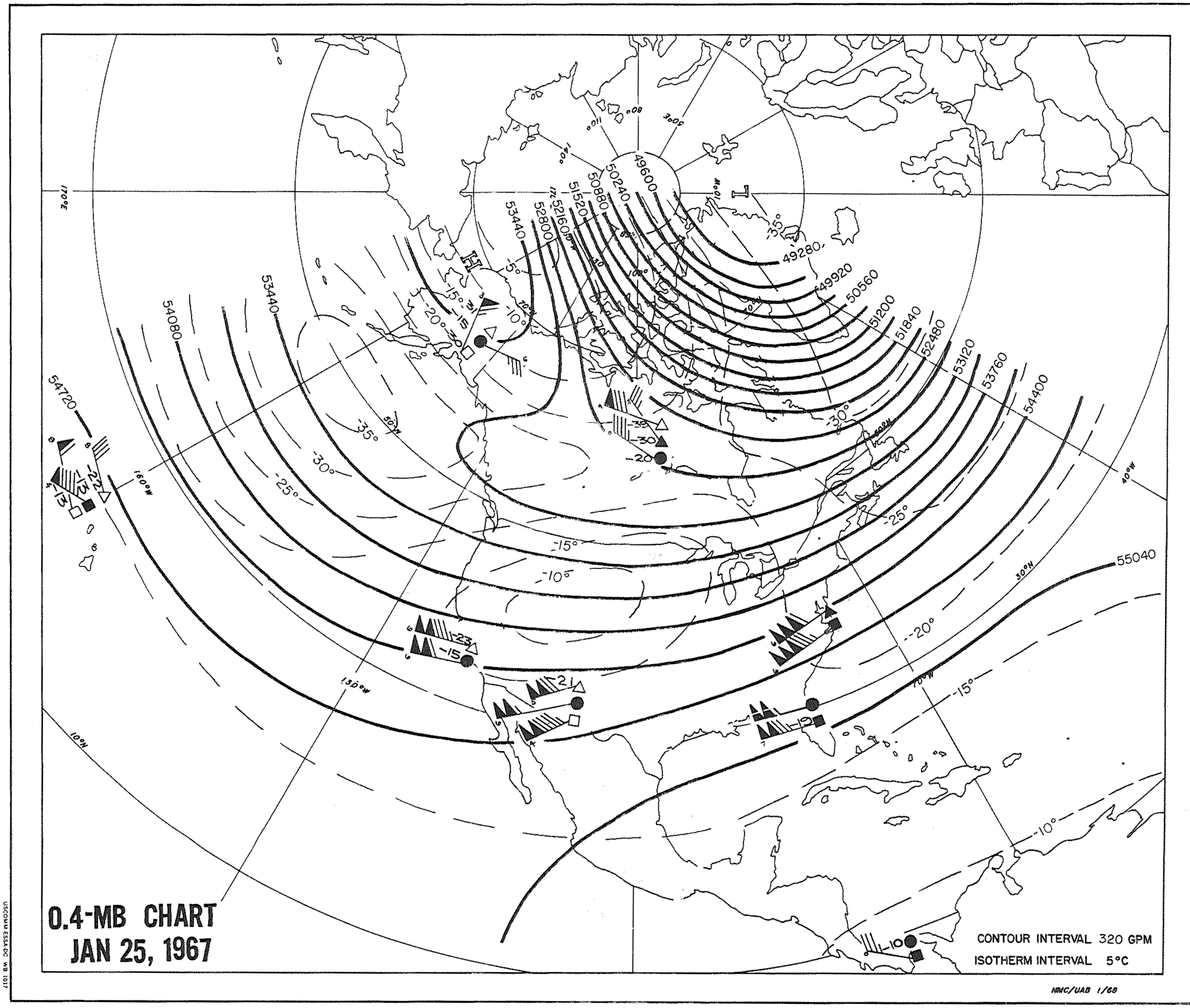
USCOMM-ESSA-DC WB 1017

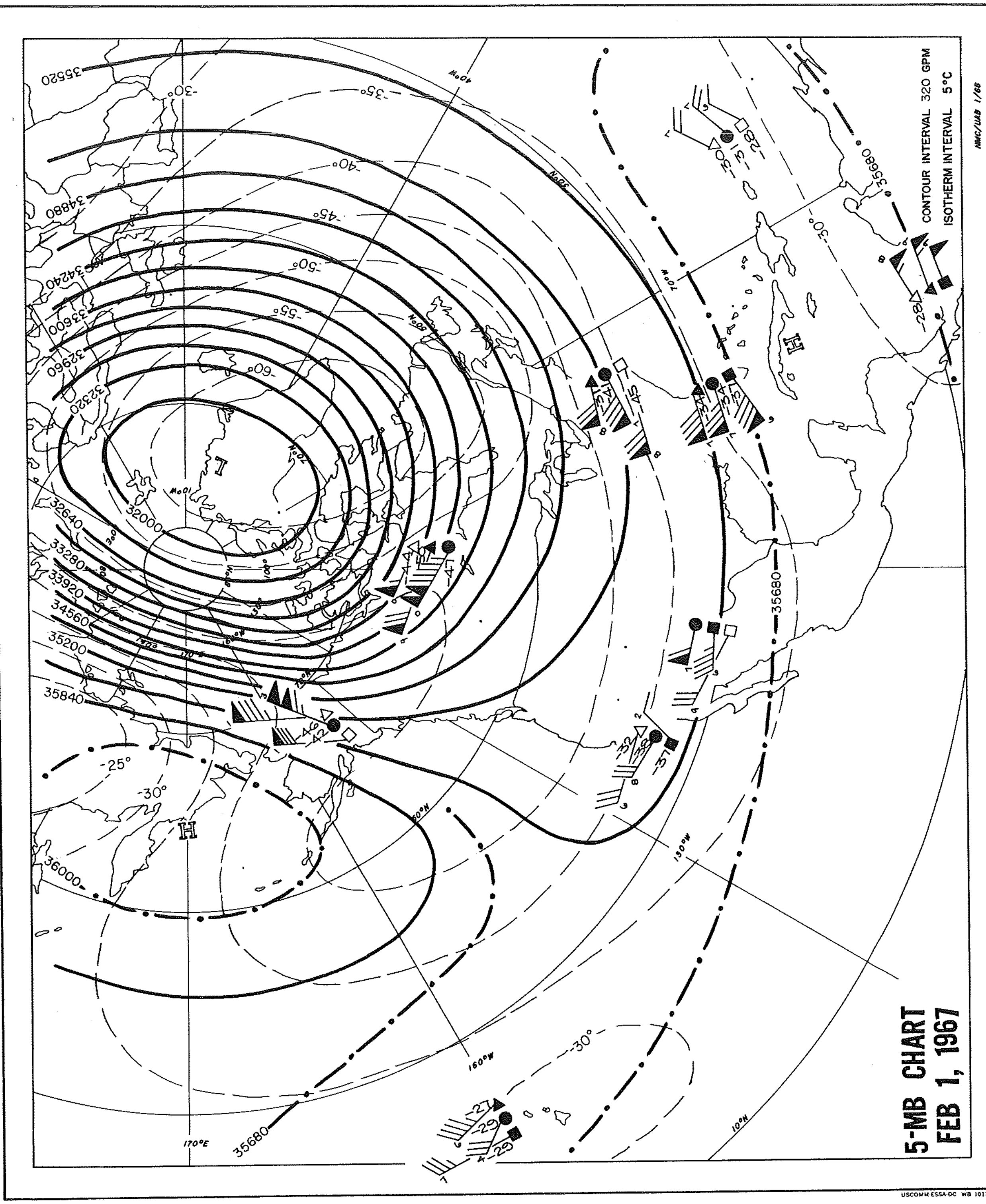

0.4-MB CHART
JAN 18, 1967
CONTOUR INTERVAL 320 GPM
ISOTHERM INTERVAL 5°C
NMC/UAB 1/68
49280
49600
49920
50240
50560
50880
51200
51520
51840
52160
52480
52800
53120
53440
53760
54080
54400
54720
USCOMM-ESSA-DC WB 1017

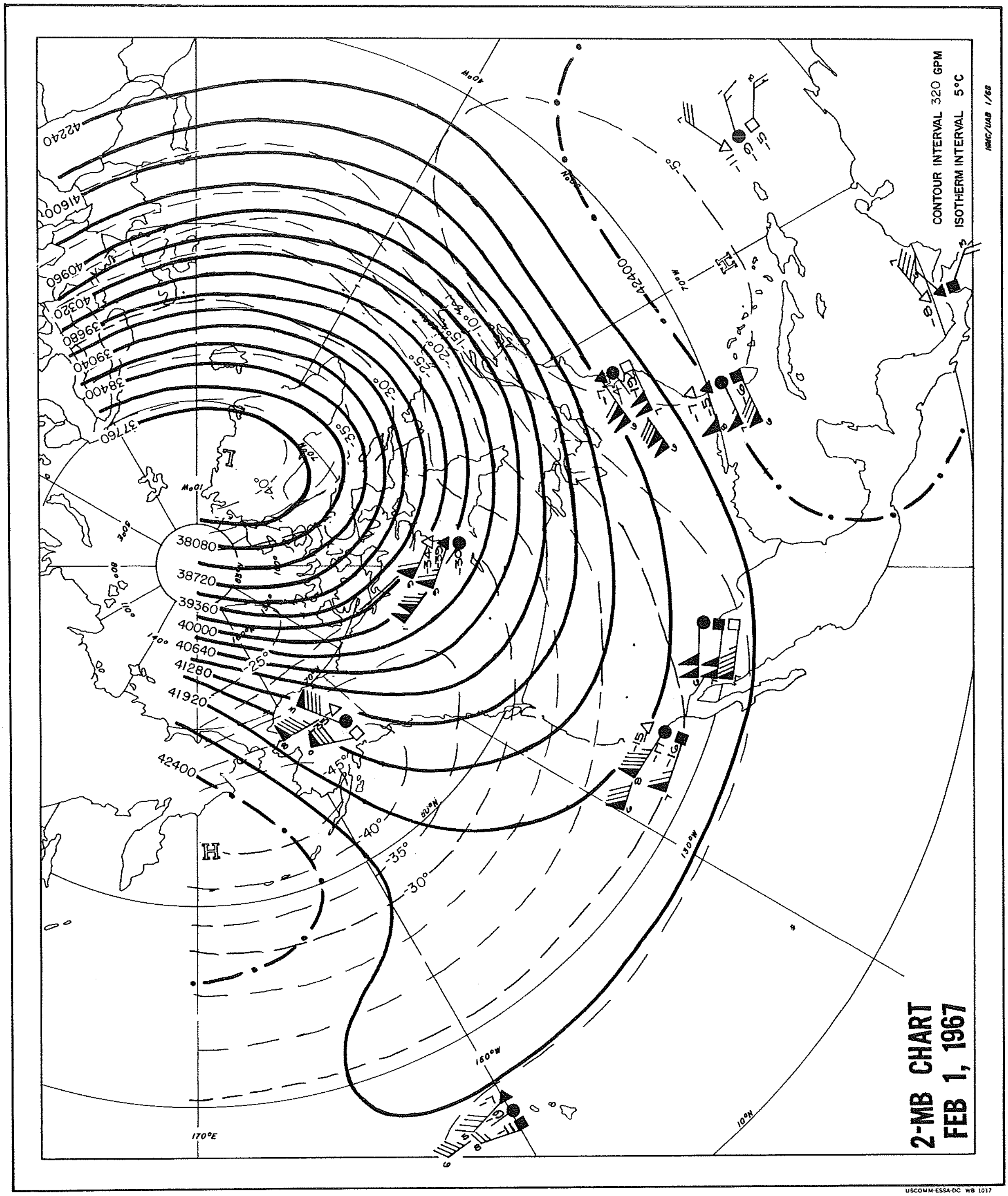

5-MB CHART
JAN 25, 1967
CONTOUR INTERVAL 320 GPM
ISOTHERM INTERVAL 5°C
USCOMM-ESSA-DC WB 1017

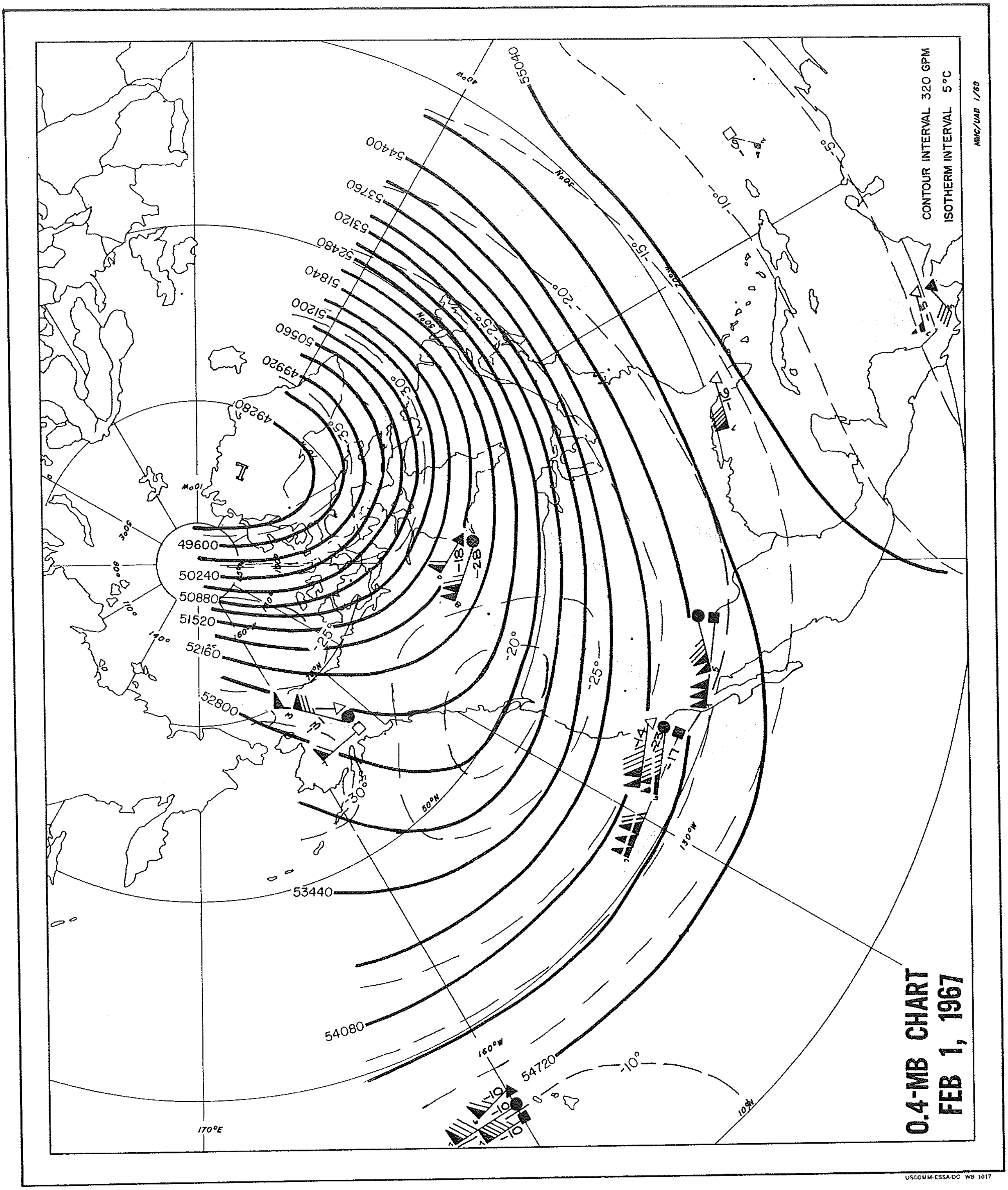


USCOMM-ESSA-DC WB 1017

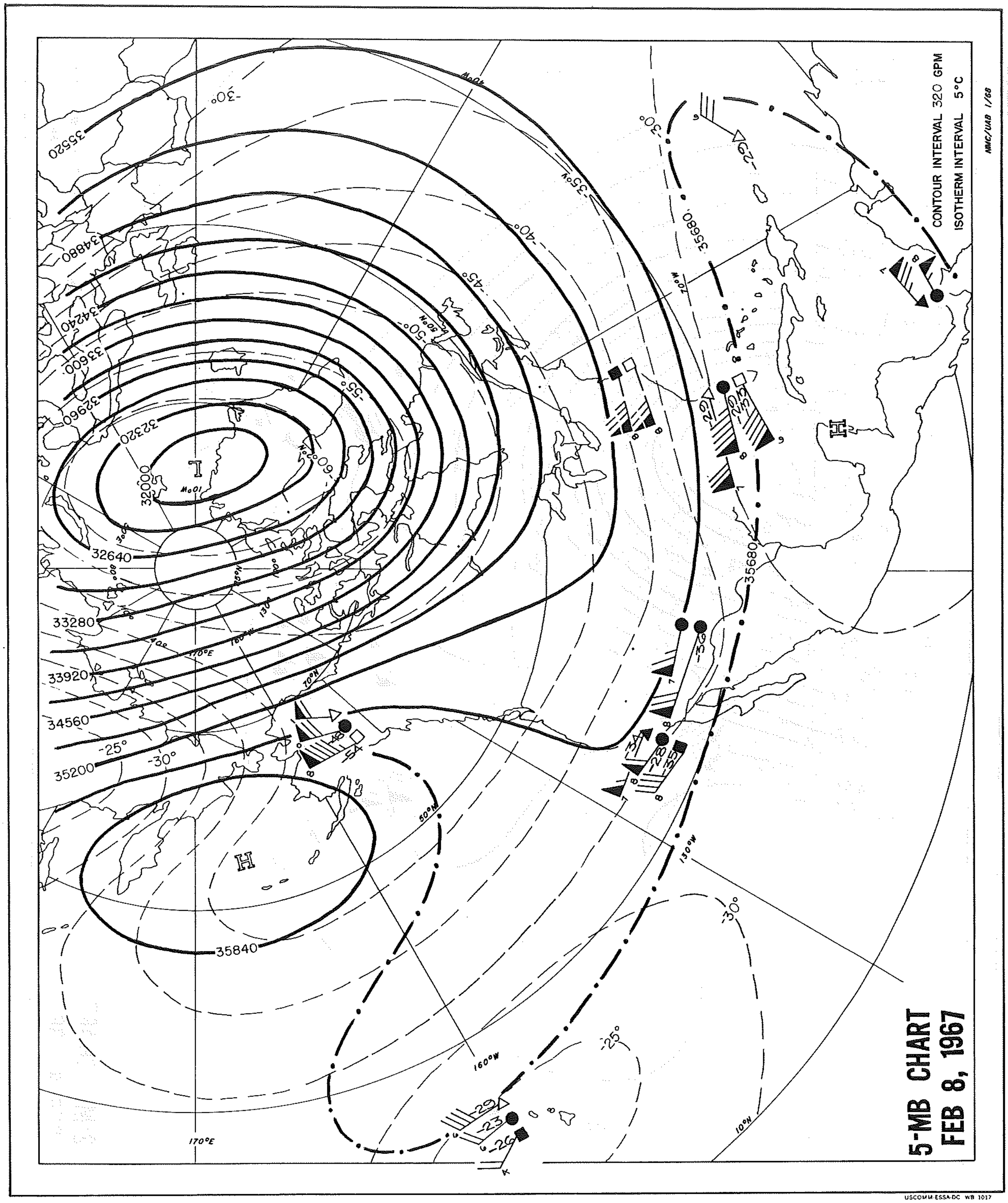

0.4-MB CHART
JAN 25, 1967
CONTOUR INTERVAL 320 GPM
ISOTHERM INTERVAL 5°C
NMC/UAB 1/68
USCOMM-ESSA-DC WB 1017
49600
50240
50880
51520
52160
52800
53440
54080
54720
49280
49920
50560
51200
51840
52480
53120
53760
54400
55040

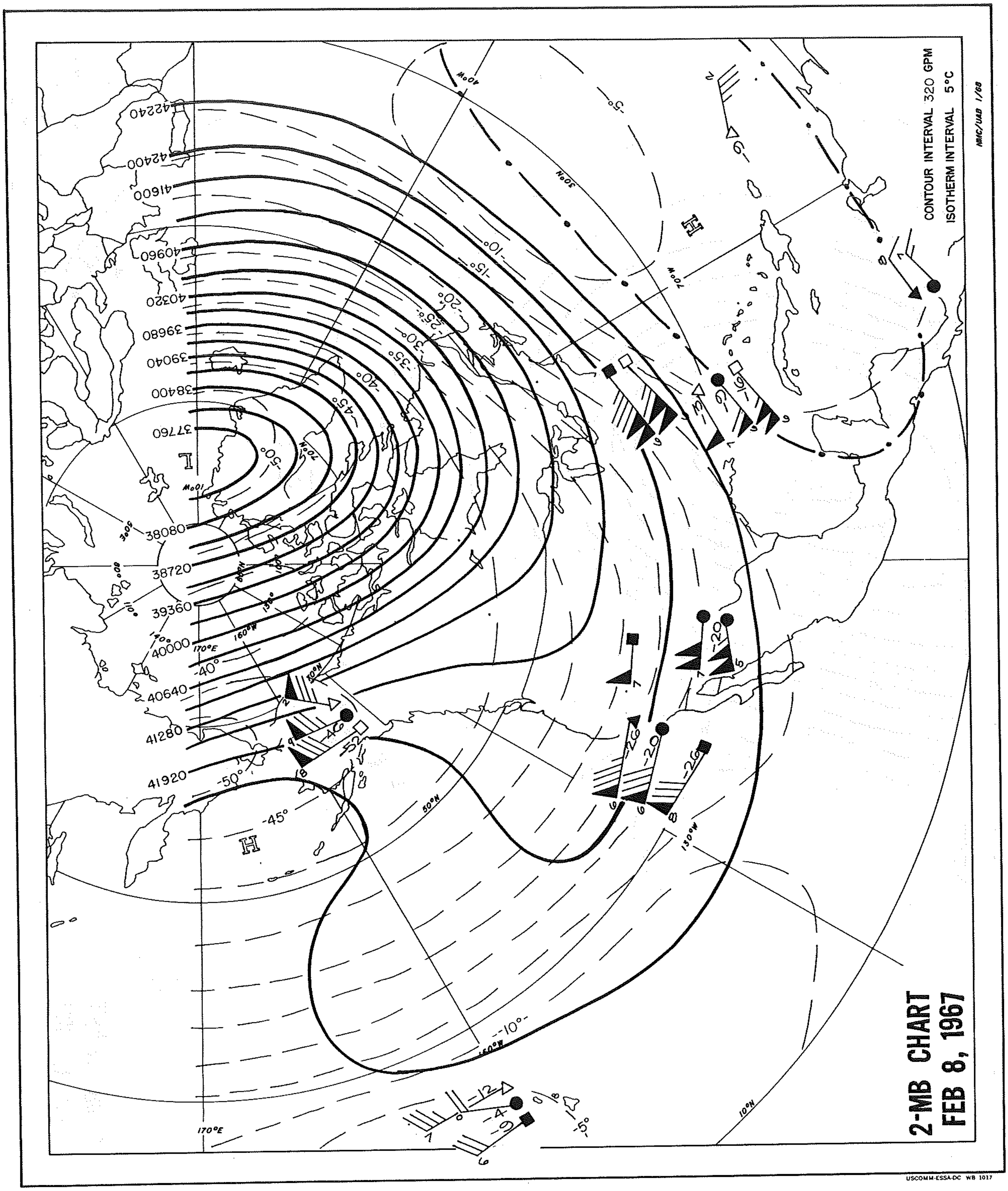

5-MB CHART
FEB 1, 1967
CONTOUR INTERVAL 320 GPM
ISOTHERM INTERVAL 5°C
NMC/UAD 1/68


2-MB CHART
FEB 1, 1967
CONTOUR INTERVAL 320 GPM
ISOTHERM INTERVAL 5°C
37760
38080
38400
38720
39040
39360
39680
40000
40320
40640
40960
41280
41600
41920
42240
42400
L
H
H
-5°
-10°
-15°
-20°
-25°
-30°
-35°
-40°
-45°
40°W
70°W
100°W
130°W
160°W
170°E
140°
110°
80°
50°N
70°N
USCOMM-ESSA-DC WB 1017

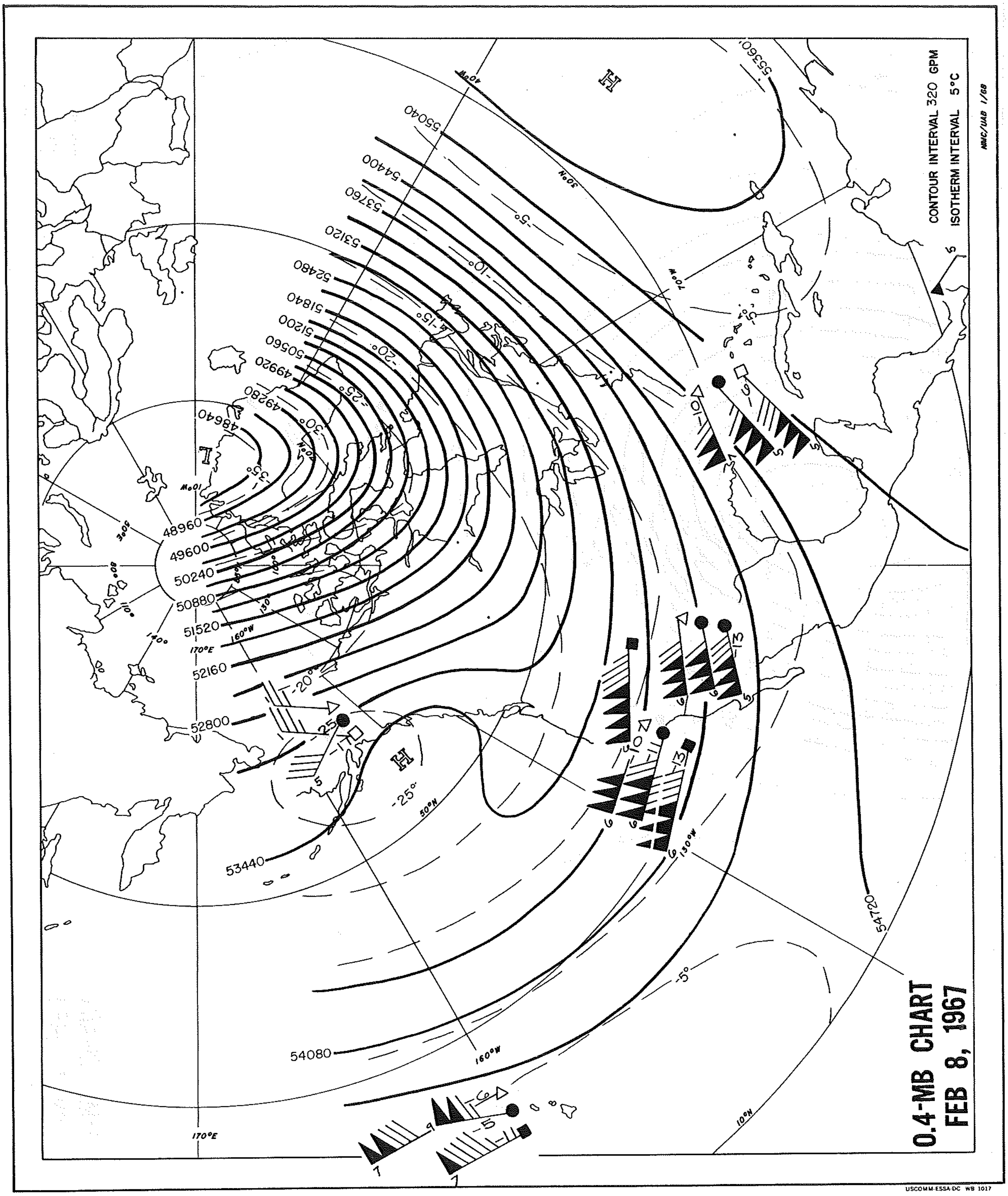


USCOMM-ESSA-DC WB 1017

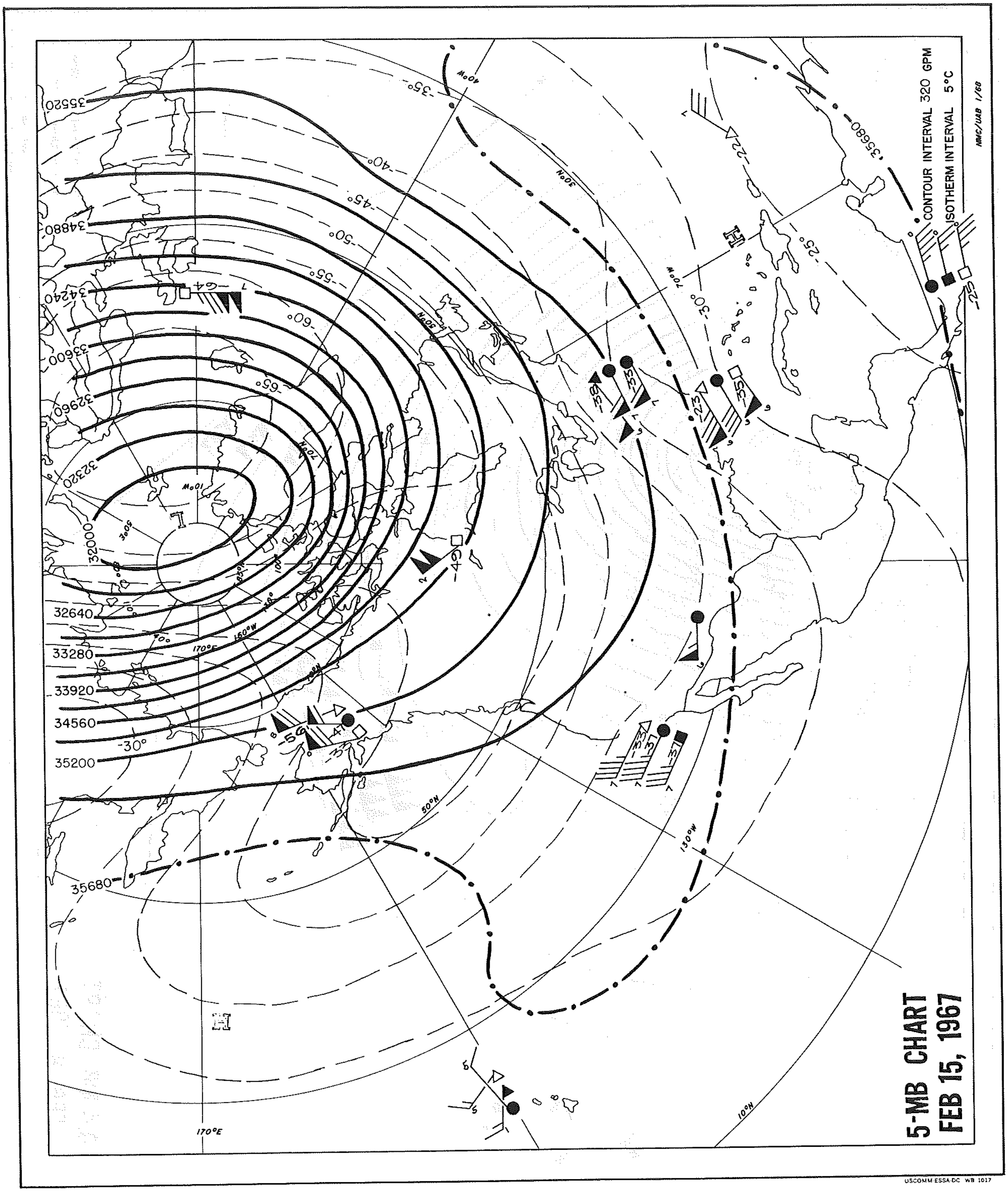

5-MB CHART
FEB 8, 1967
CONTOUR INTERVAL 320 GPM
ISOTHERM INTERVAL 5°C
32000
32320
32640
32960
33280
33600
33920
34240
34560
34880
35200
35520
35680
35840
-25°
-30°
-35°
-40°
-45°
-50°
-55°
-60°
L
H
170°E
160°W
130°W
10°N
50°N
70°N
USCOMM-ESSA-DC WB 1017

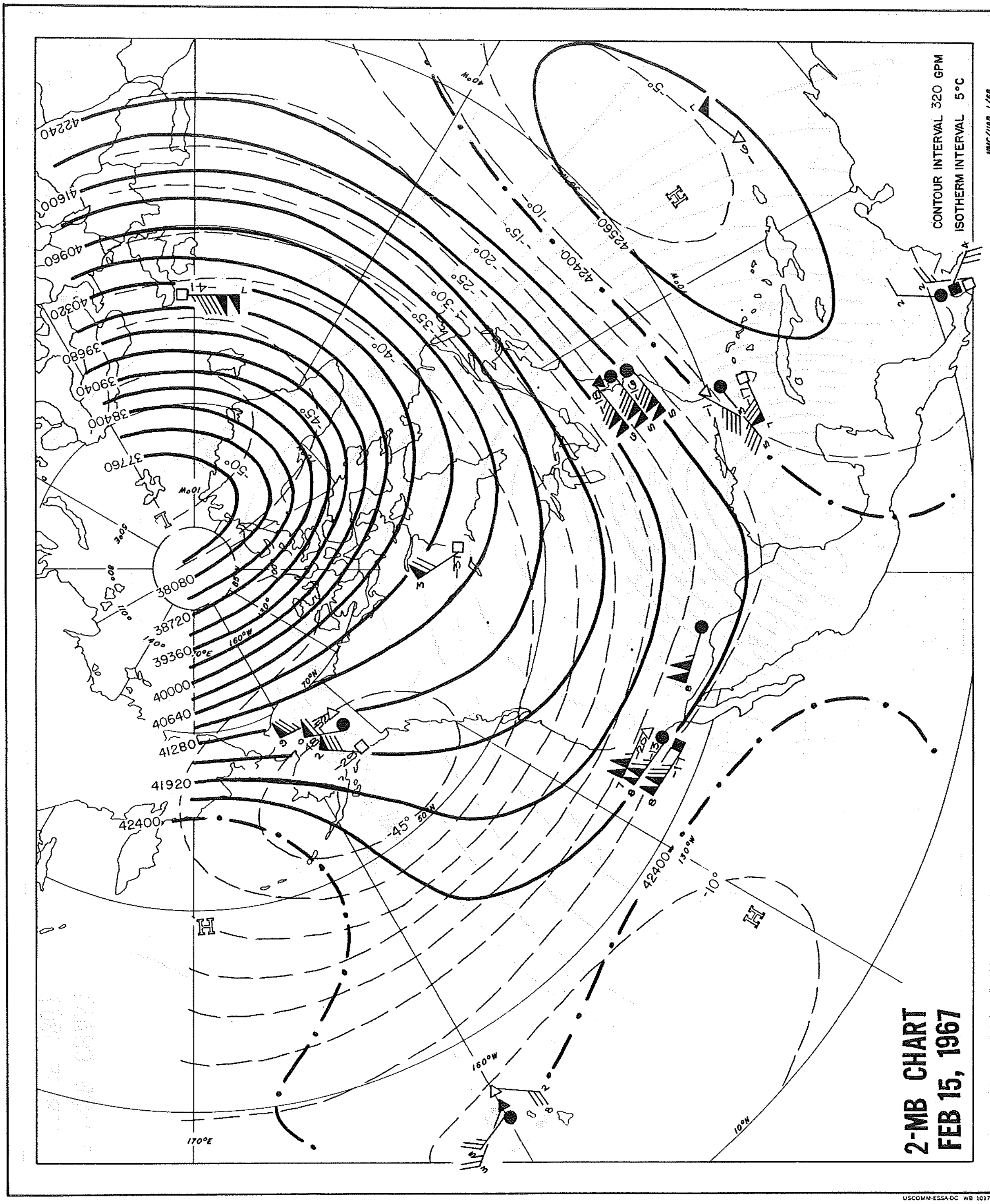


2-MB CHART
FEB 8, 1967
CONTOUR INTERVAL 320 GPM
ISOTHERM INTERVAL 5°C
37760
38400
39040
39680
40320
40960
41600
38080
38720
39360
40000
40640
41280
41920
USCOMM-ESSA-DC WB 1017

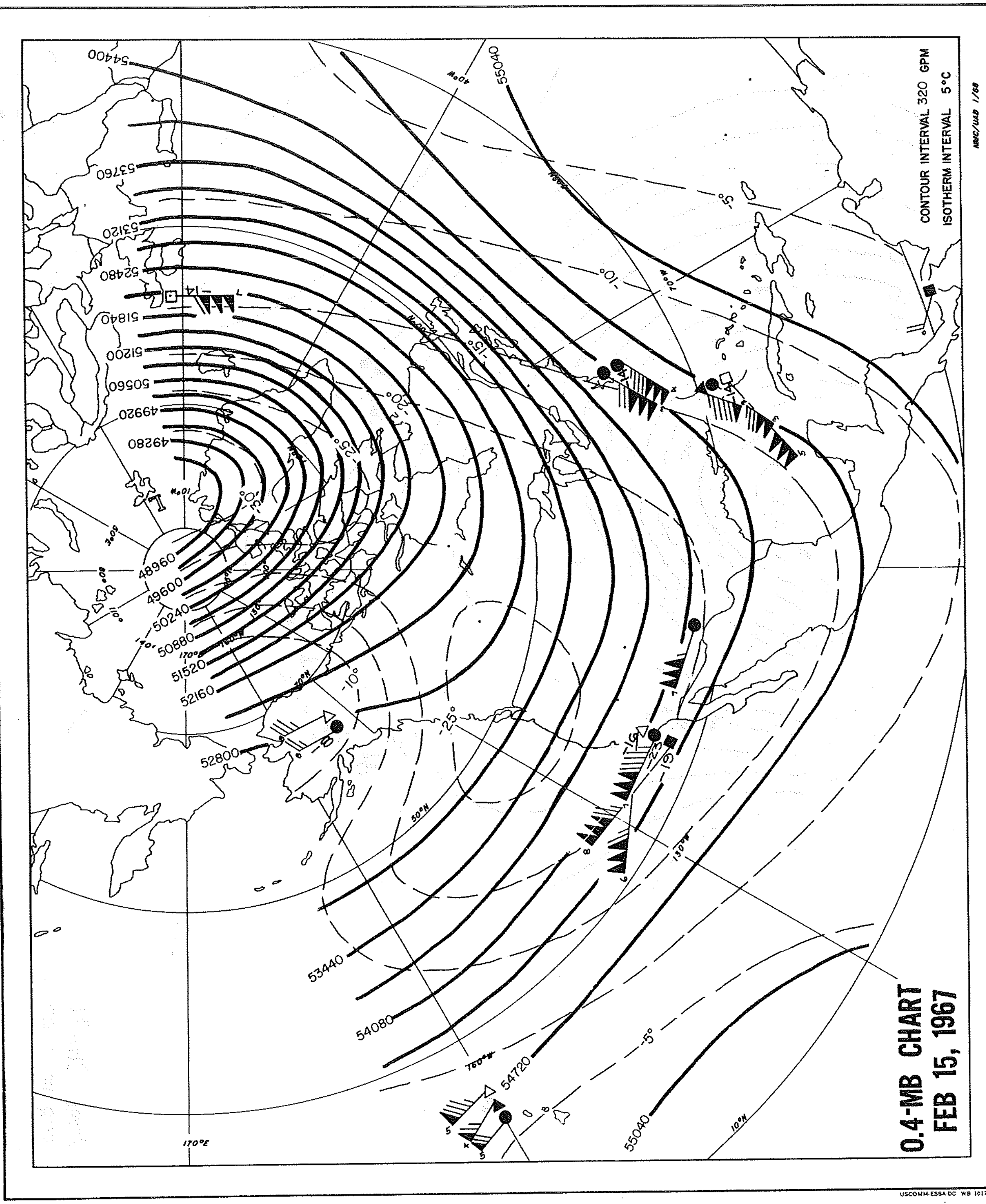


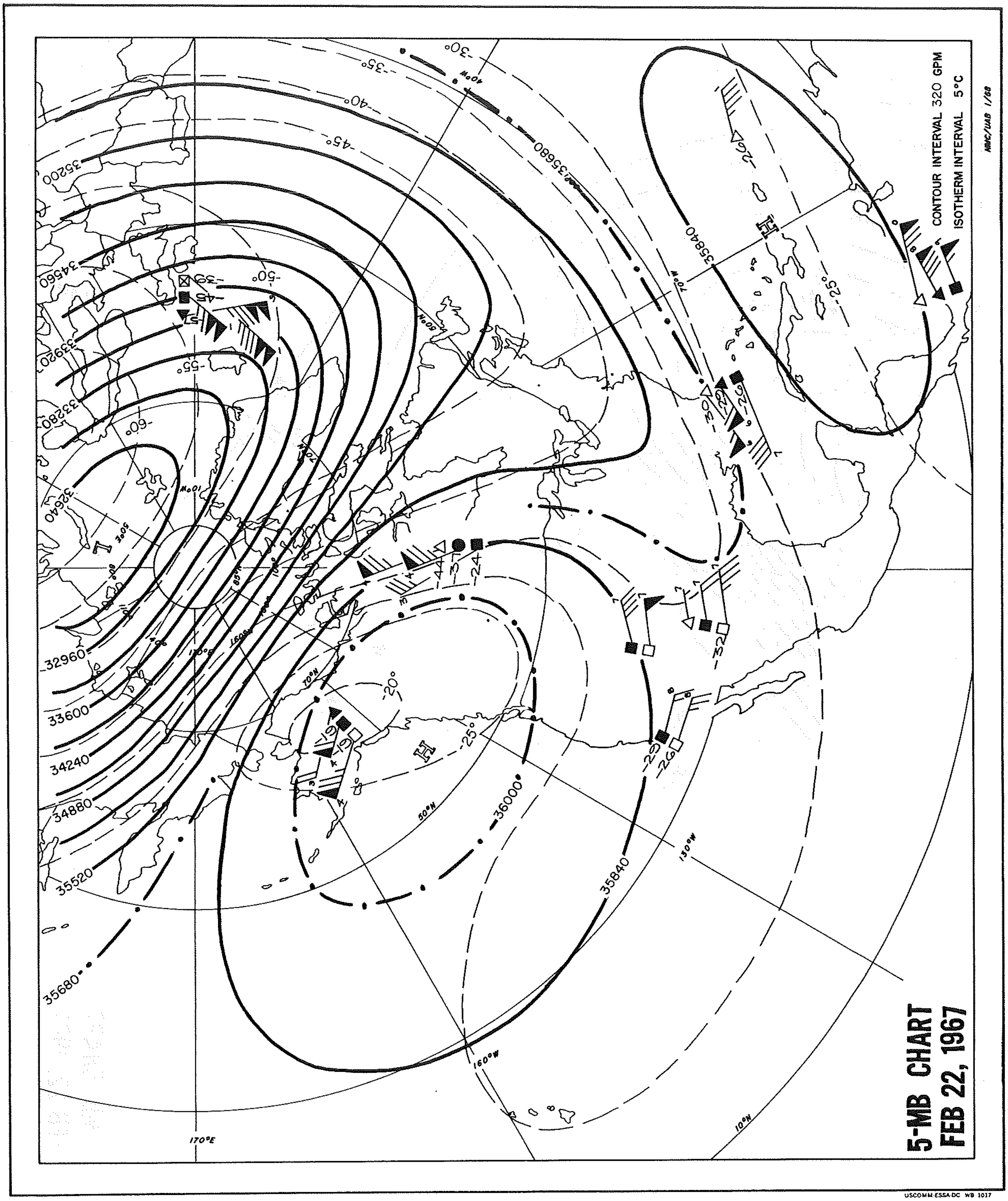
USCOMM-ESSA-DC WB 1017

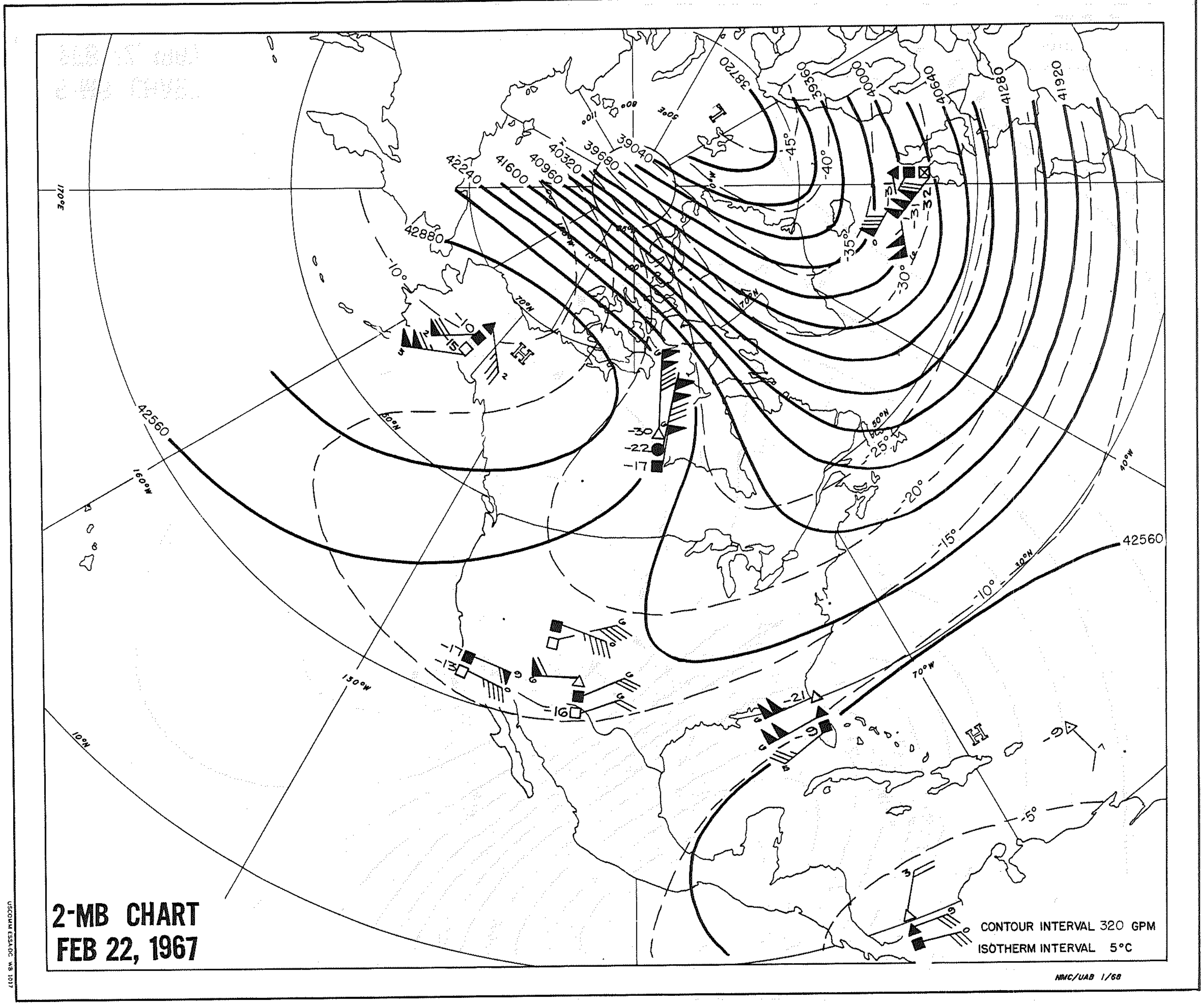

5-MB CHART
FEB 15, 1967
CONTOUR INTERVAL 320 GPM
ISOTHERM INTERVAL 5°C
32000
32640
33280
33920
34560
35200
35680
-30°
USCOMM-ESSA-DC WB 1017



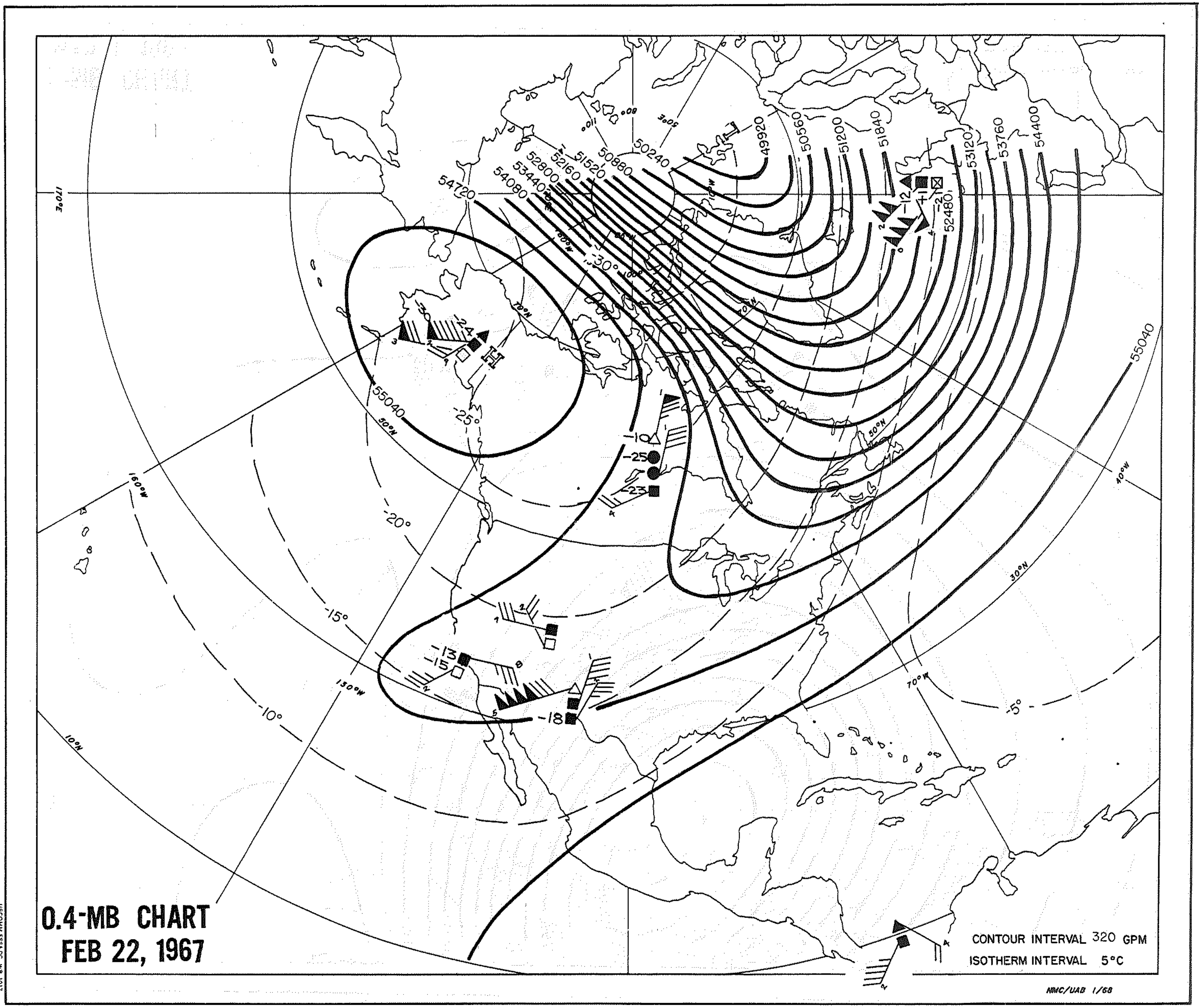
USCOMM-ESSA-DC WB 1017


0.4-MB CHART
FEB 15, 1967
CONTOUR INTERVAL 320 GPM
ISOTHERM INTERVAL 5°C
USCOMM-ESSA-DC WB 1017

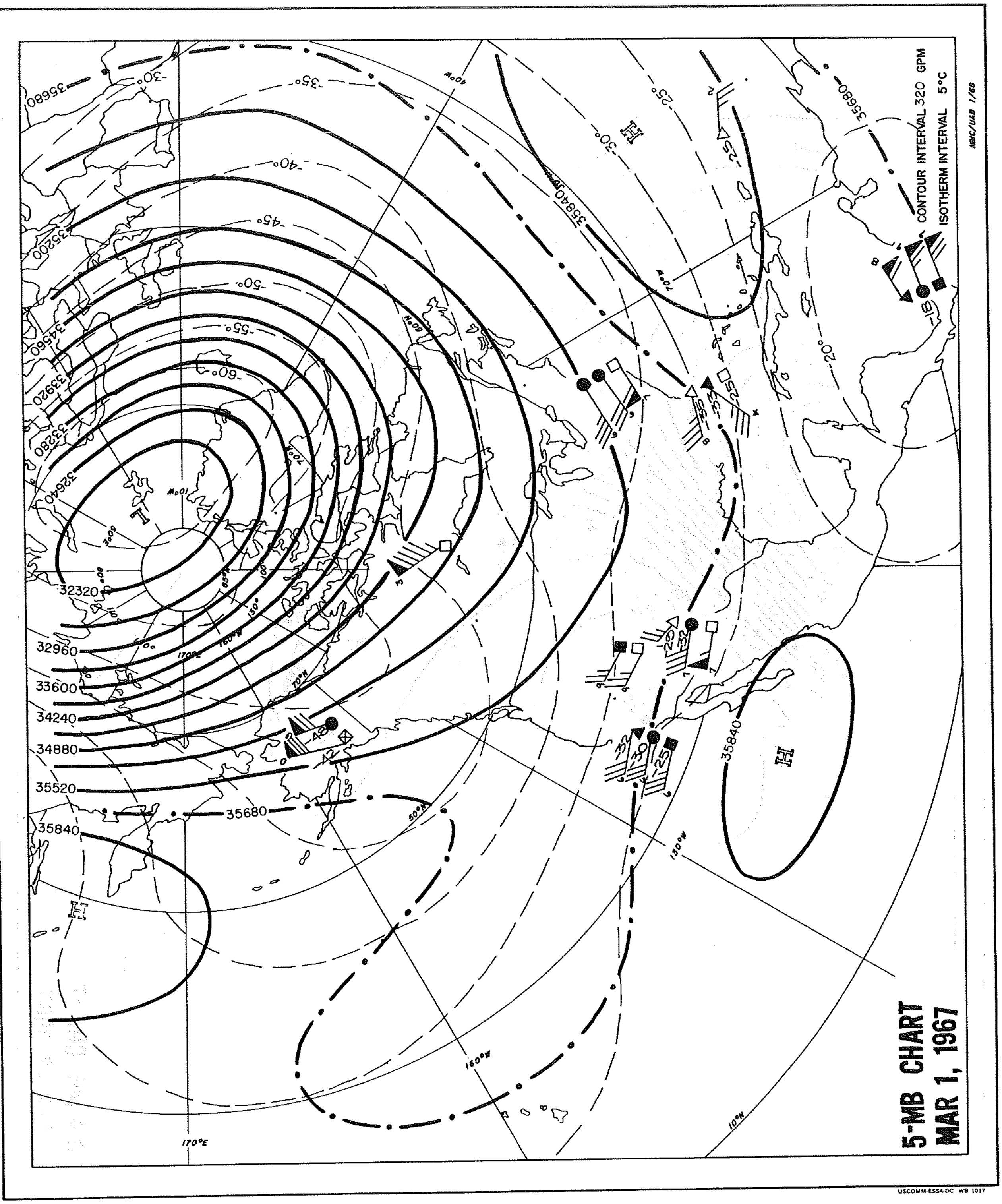

5-MB CHART
FEB 22, 1967
CONTOUR INTERVAL 320 GPM
ISOTHERM INTERVAL 5°C
USCOMM-ESSA-DC WB 1017



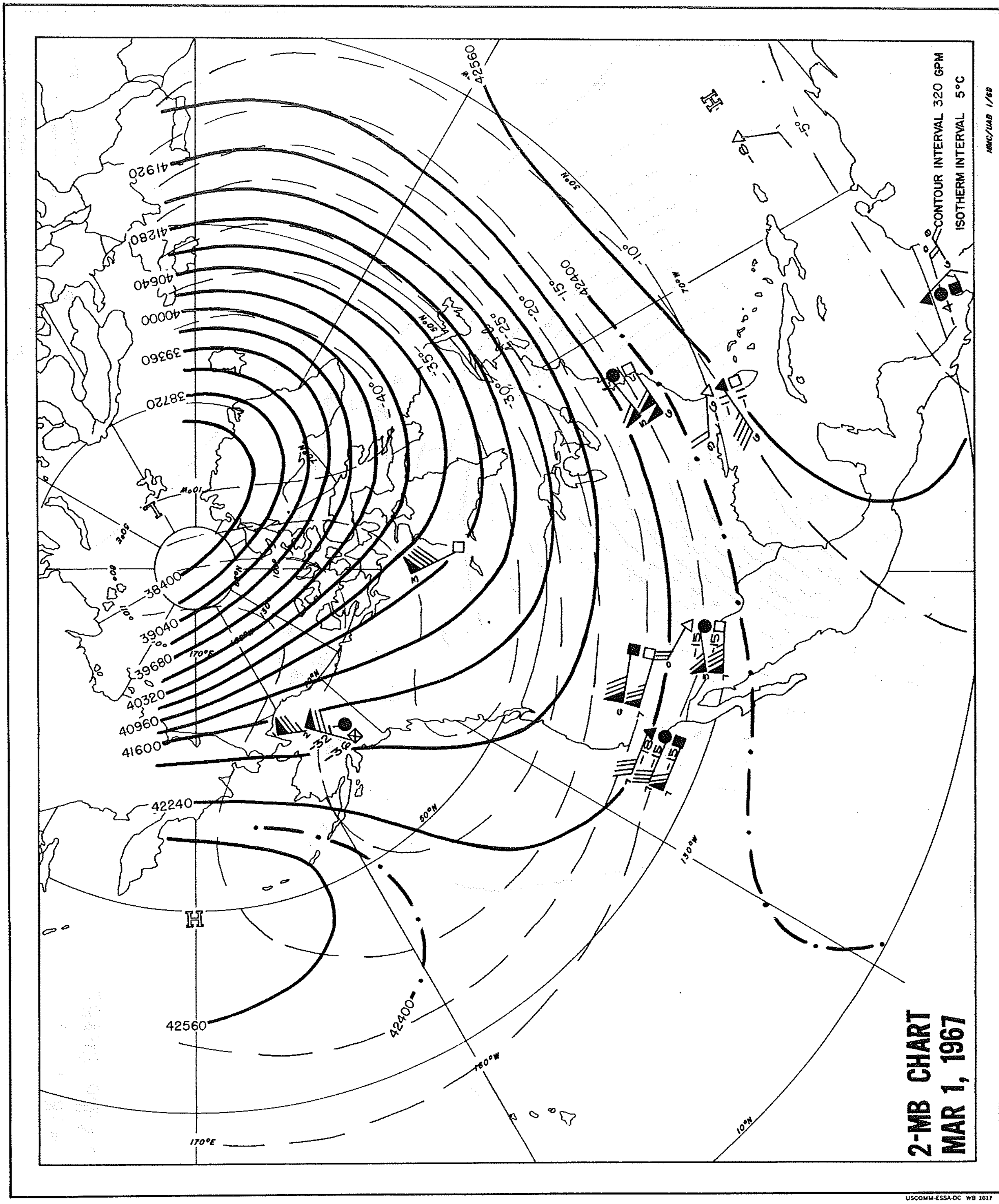
USCOMM ESSA-DC WB 1017



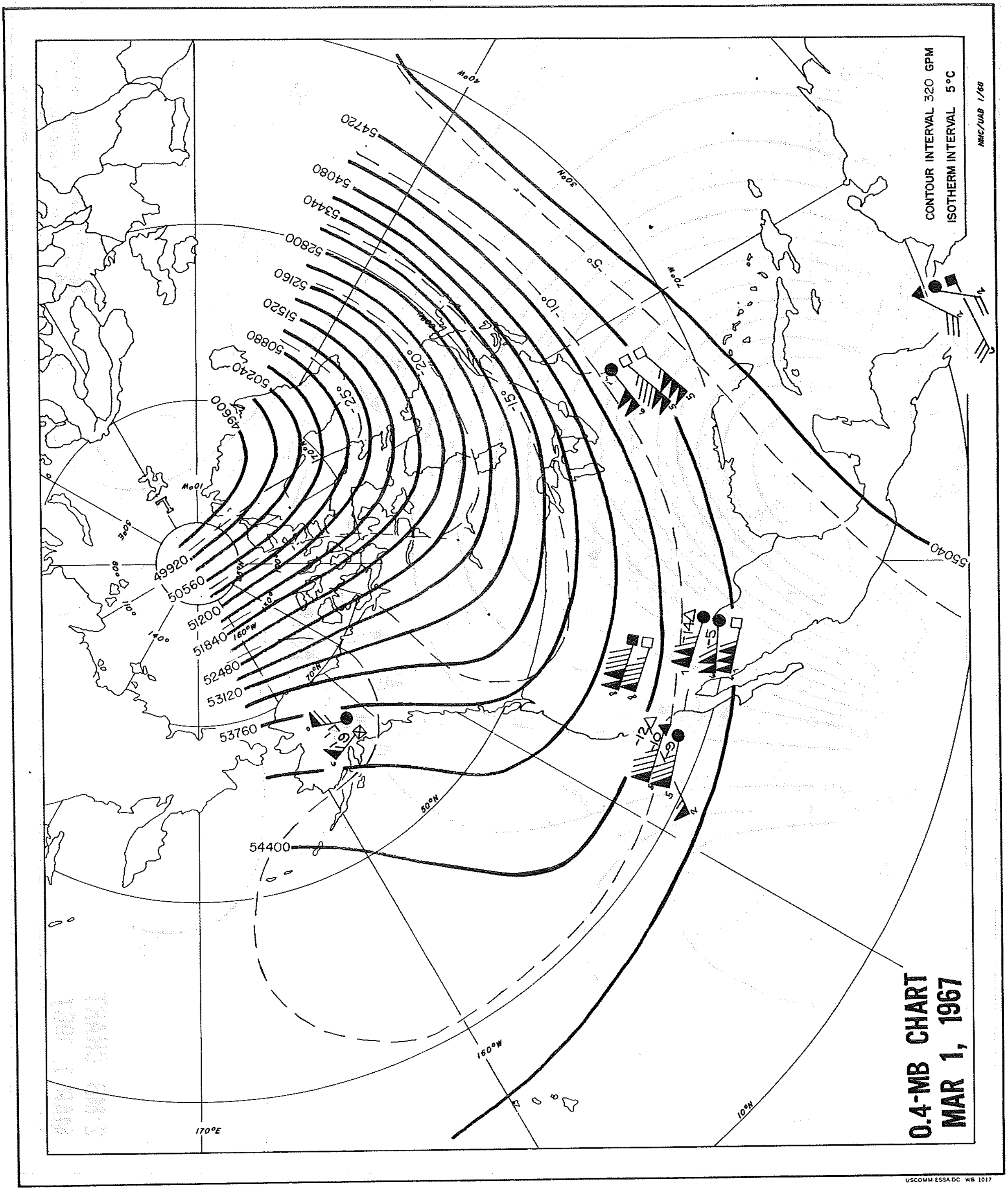
0.4-MB CHART
FEB 22, 1967
CONTOUR INTERVAL 320 GPM
ISOTHERM INTERVAL 5°C
NMC/UAB 1/68
49920
50240
50560
50880
51200
51520
51840
52160
52480
52800
53120
53440
53760
54080
54400
54720
55040
-5°
-10°
-15°
-20°
-25°
-30°



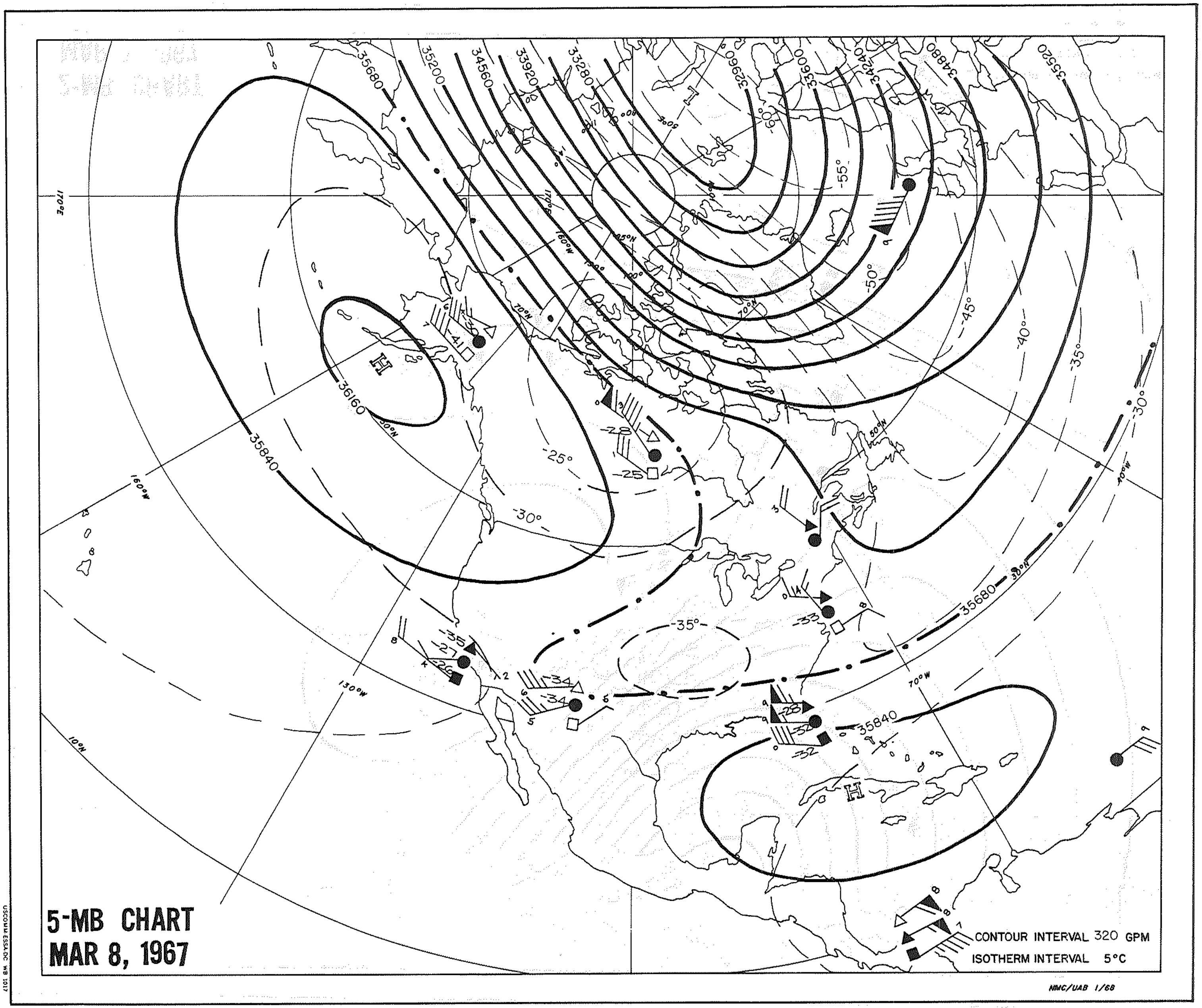
5-MB CHART
MAR 1, 1967
CONTOUR INTERVAL 320 GPM
ISOTHERM INTERVAL 5°C
32320
32960
33600
34240
34880
35520
35840
35680
USCOMM-ESSA-DC WB 1017

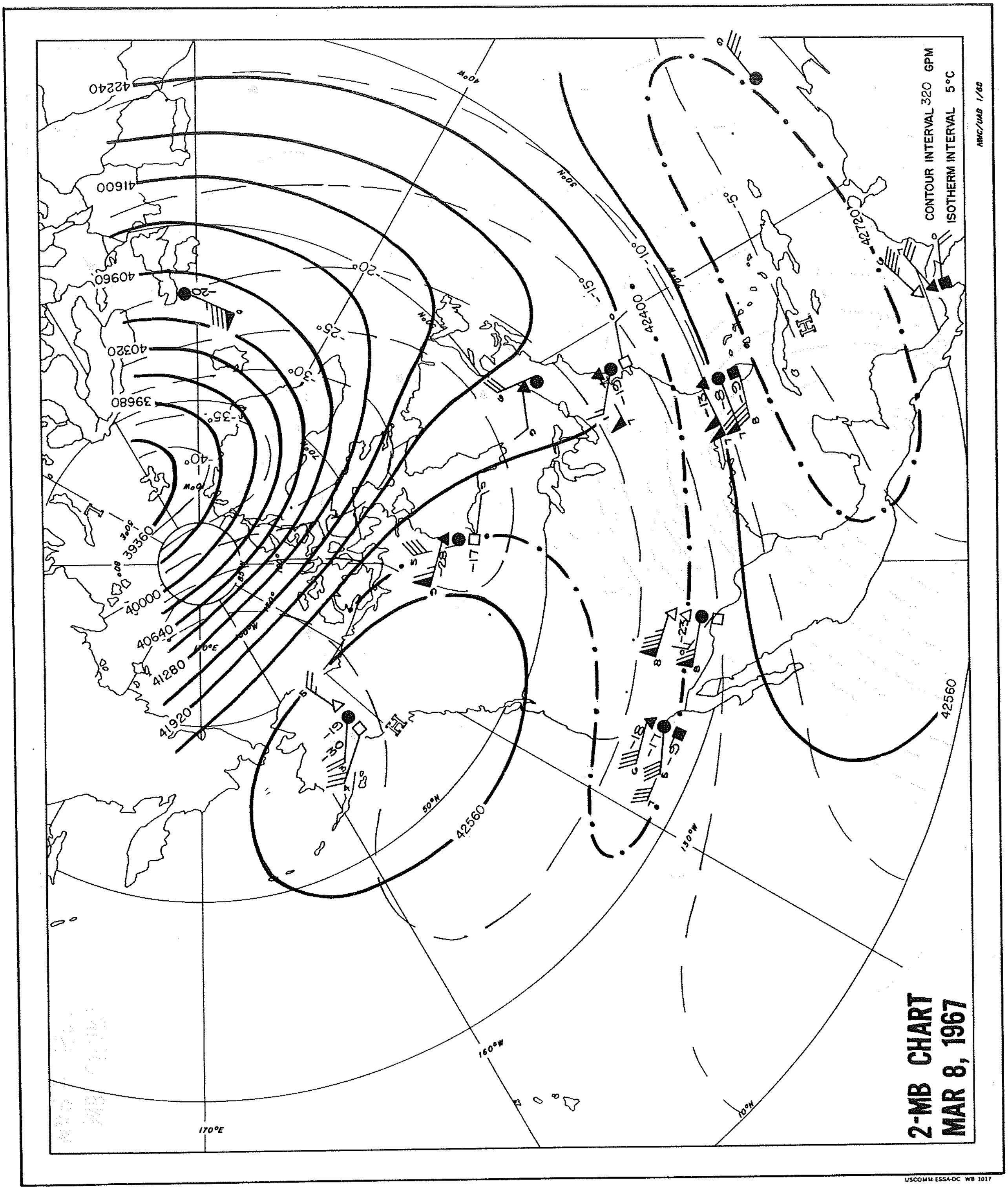


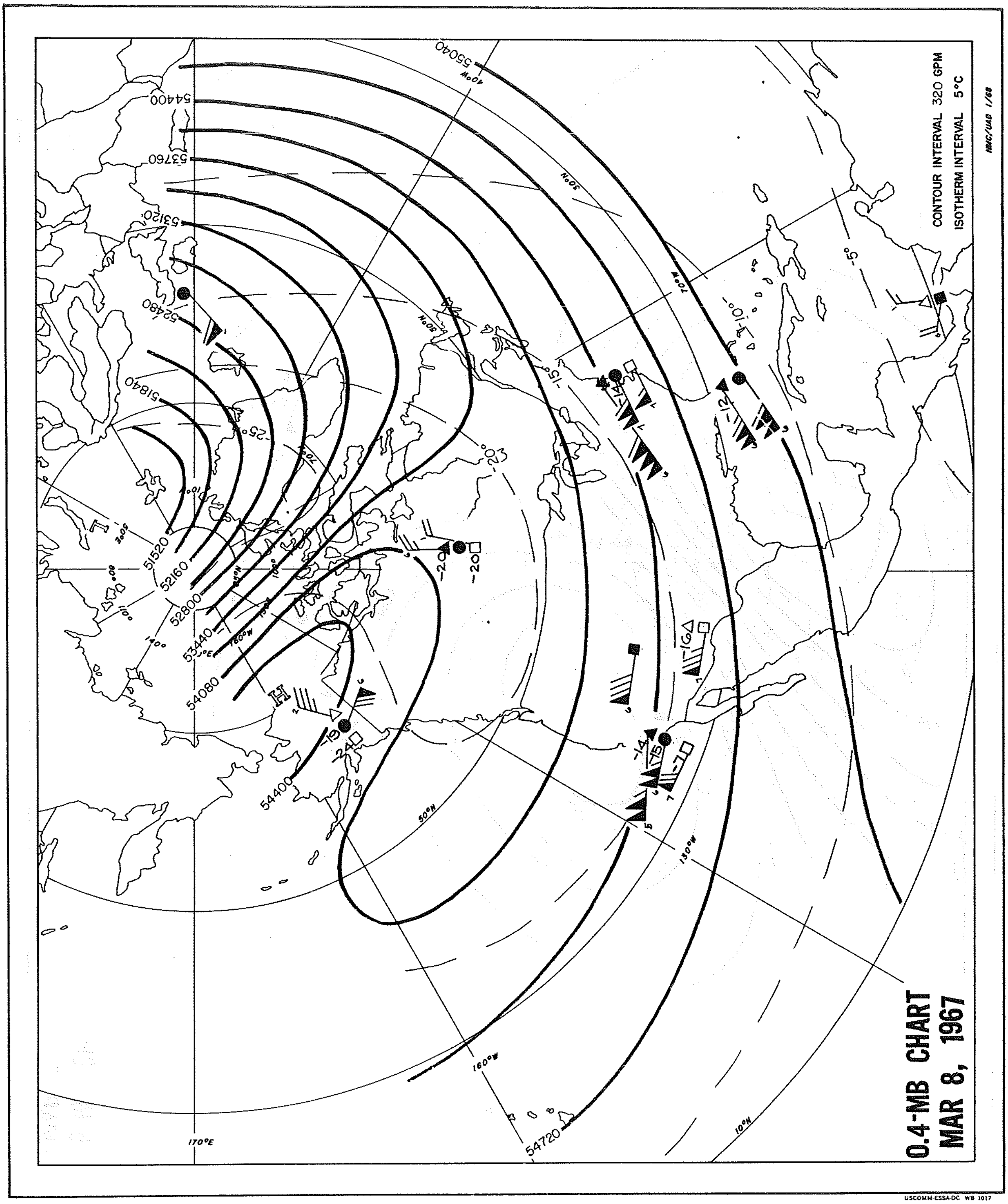
USCOMM-ESSA-DC WB 1017

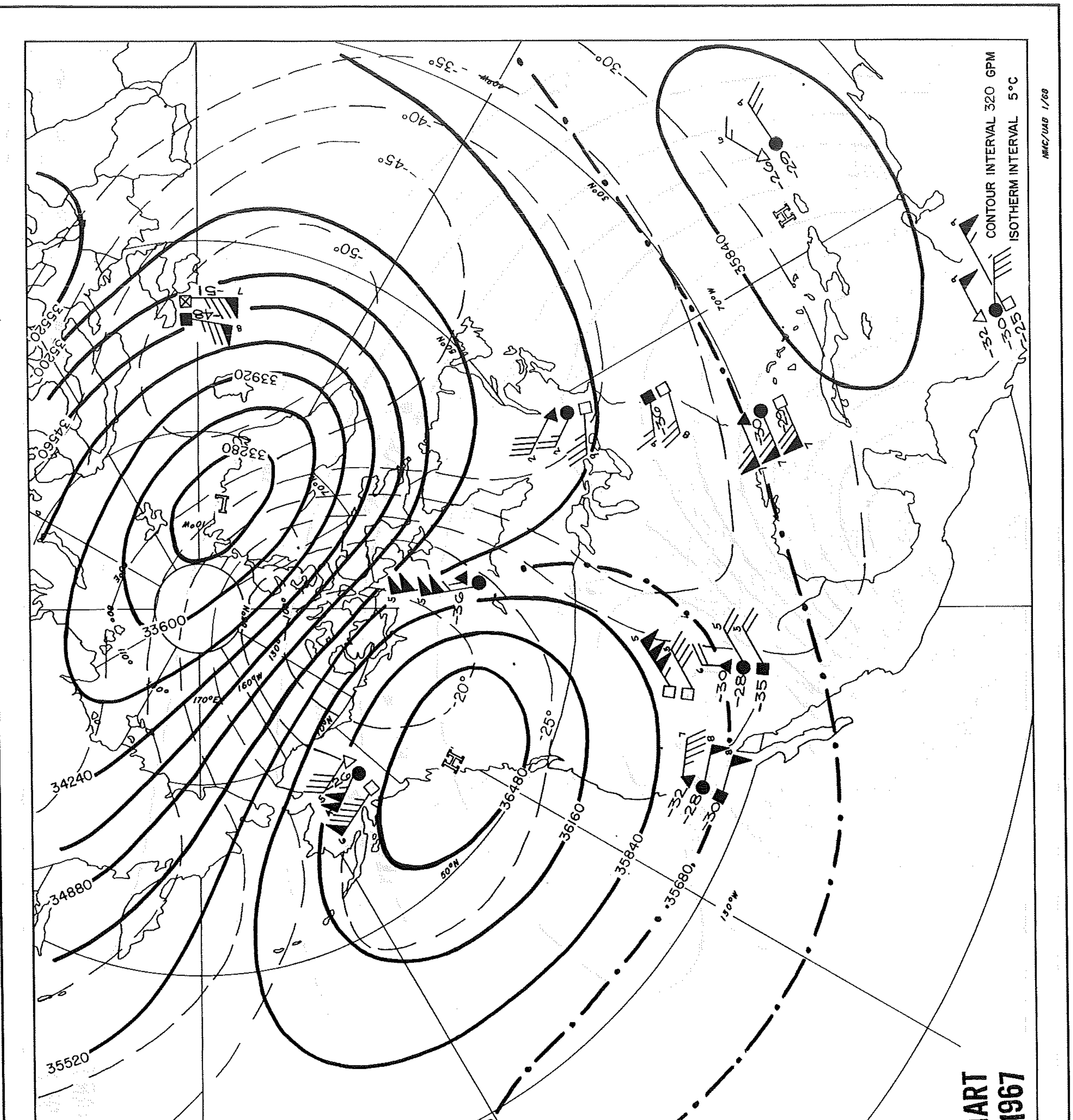


USCOMM-ESSA-DC WB 1017

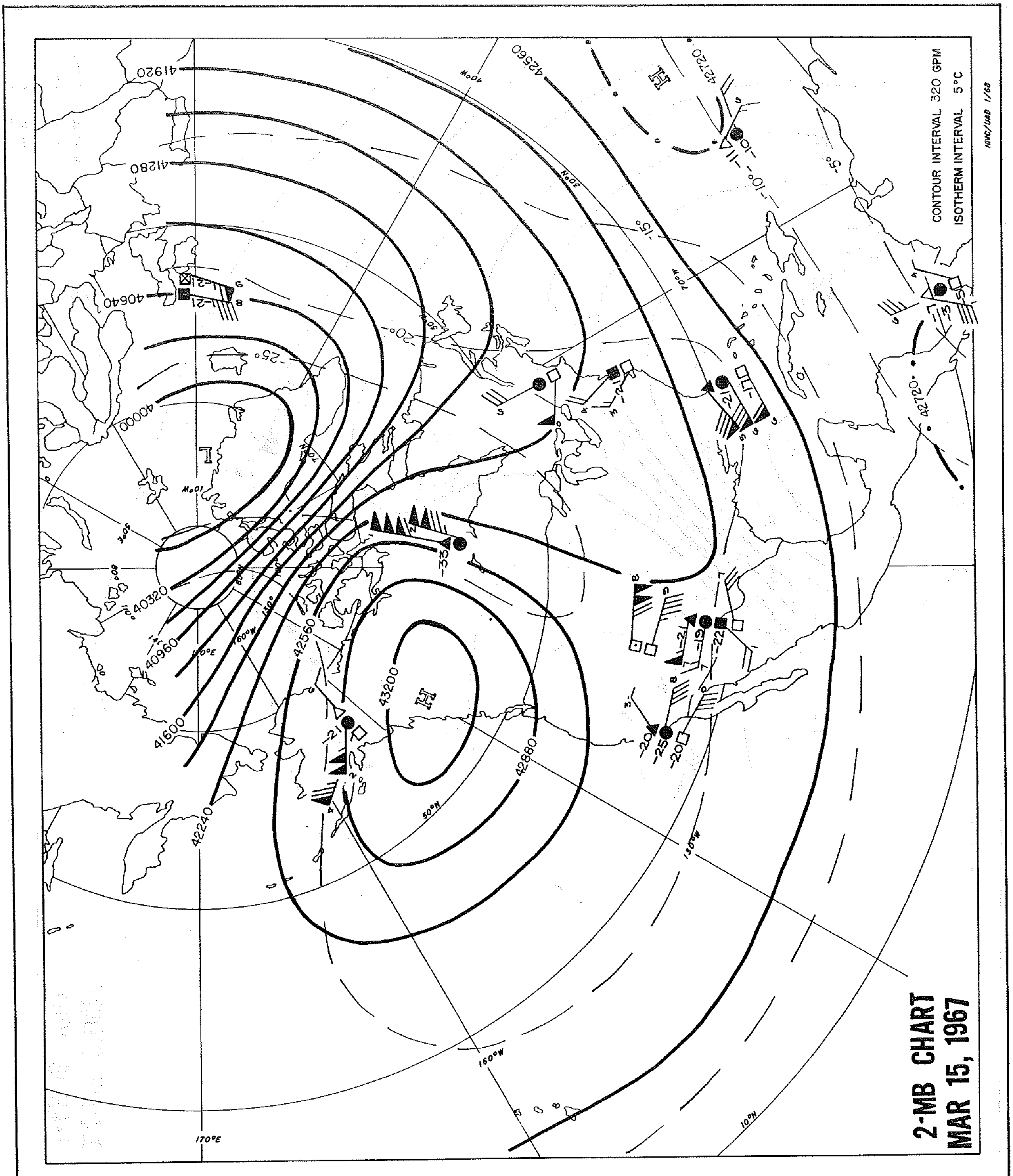

5-MB CHART
MAR 8, 1967
CONTOUR INTERVAL 320 GPM
ISOTHERM INTERVAL 5°C
35680
35200
34560
33920
33280
32960
33600
34240
34880
35520
36160
35840
H
L
-25°
-30°
-35°
-40°
-45°
-50°
-55°
-60°
70°N
50°N
30°N
10°N
170°E
160°W
130°W
70°W
40°W
NMC/UAB 1/68


2-MB CHART
MAR 8, 1967
CONTOUR INTERVAL 320 GPM
ISOTHERM INTERVAL 5°C
42240
41600
40960
40320
39680
39360
40000
40640
41280
41920
42560
42400
42720
USCOMM-ESSA-DC WB 1017


0.4-MB CHART
MAR 8, 1967
CONTOUR INTERVAL 320 GPM
ISOTHERM INTERVAL 5°C
NMC/UAB 1/68
55040
54400
53760
53120
52480
51840
51520
52160
52800
53440
54080
54400
54720
H
USCOMM-ESSA-DC WB 1017

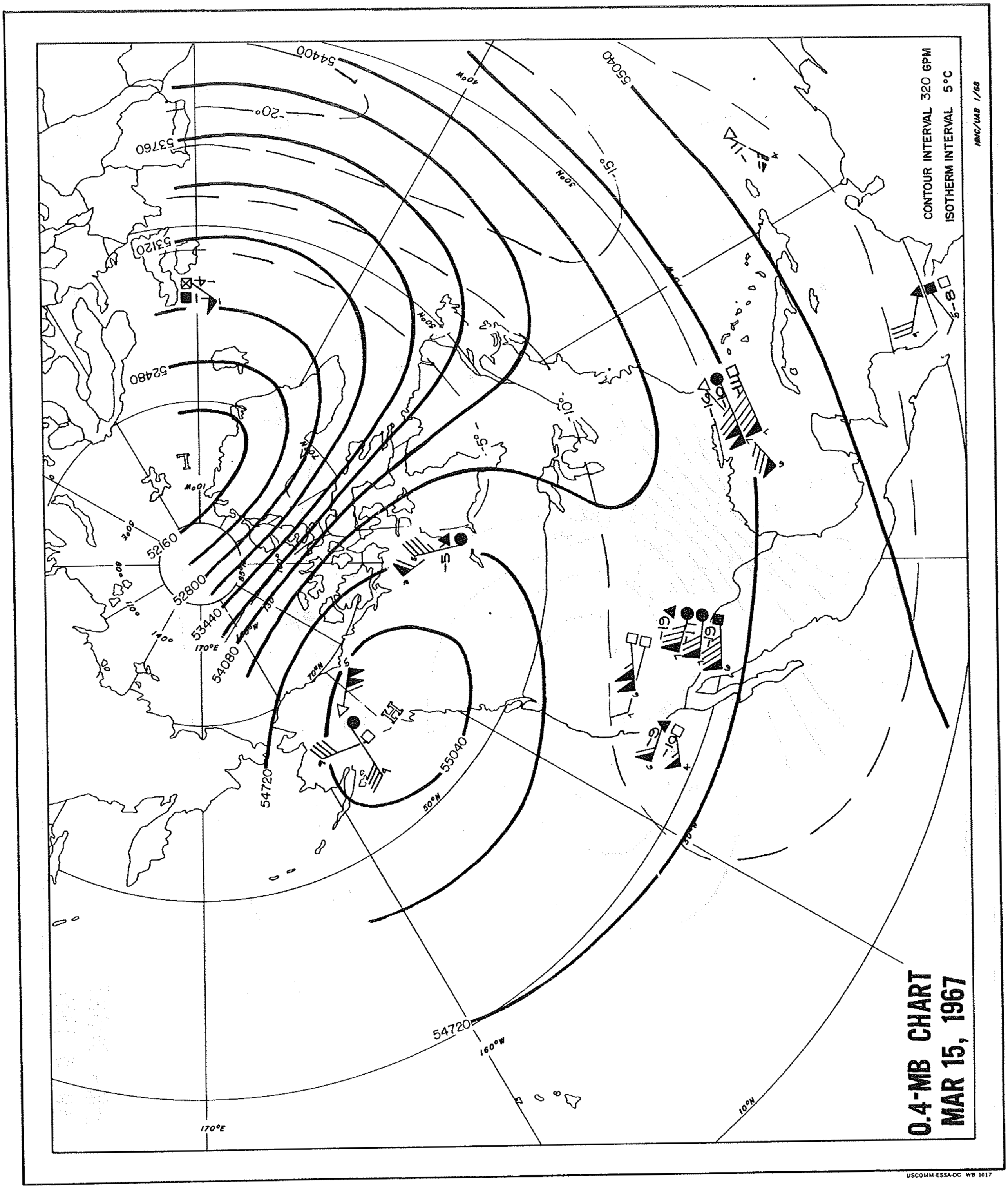


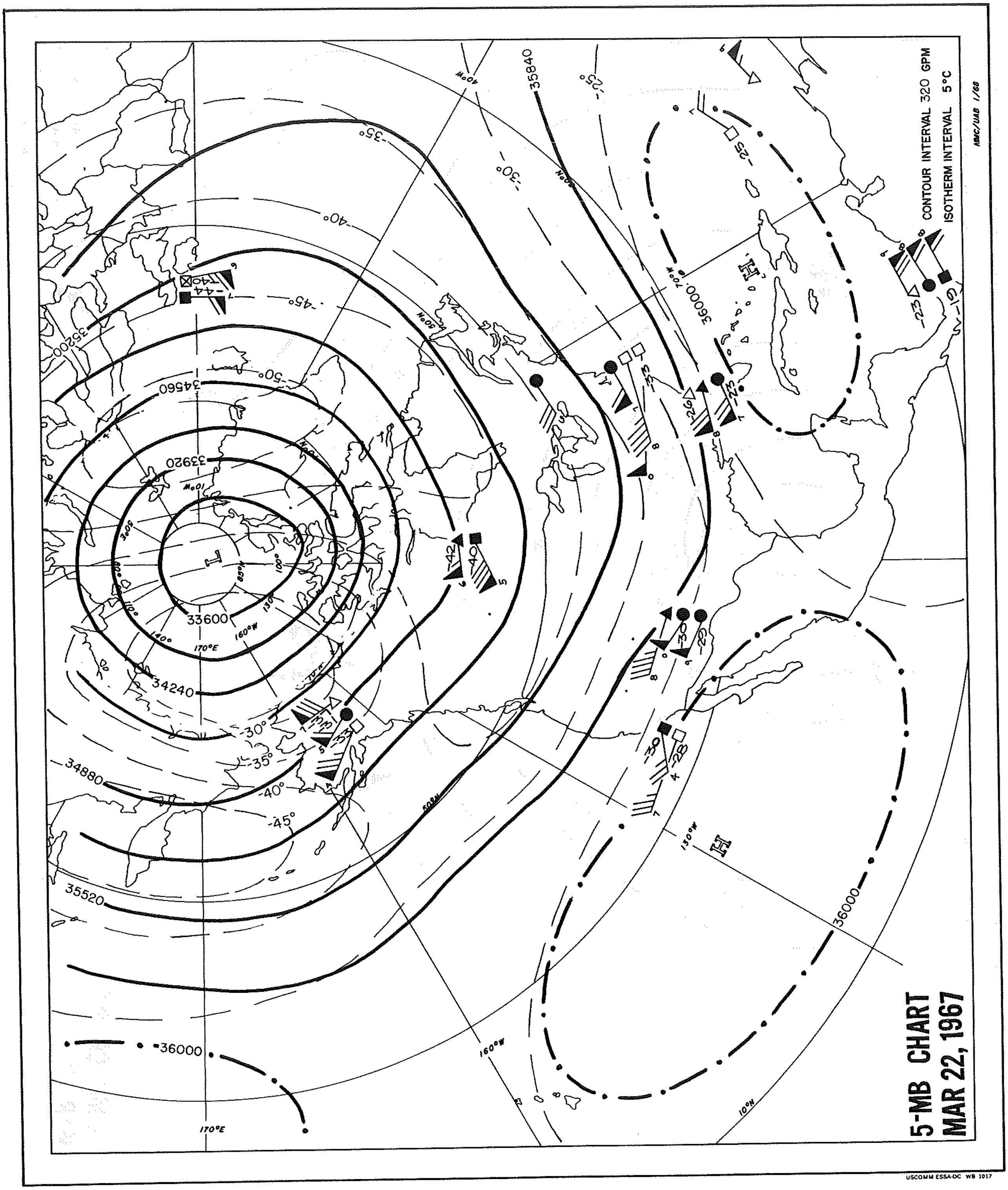
USCOMM-ESSA-DC WB 1017

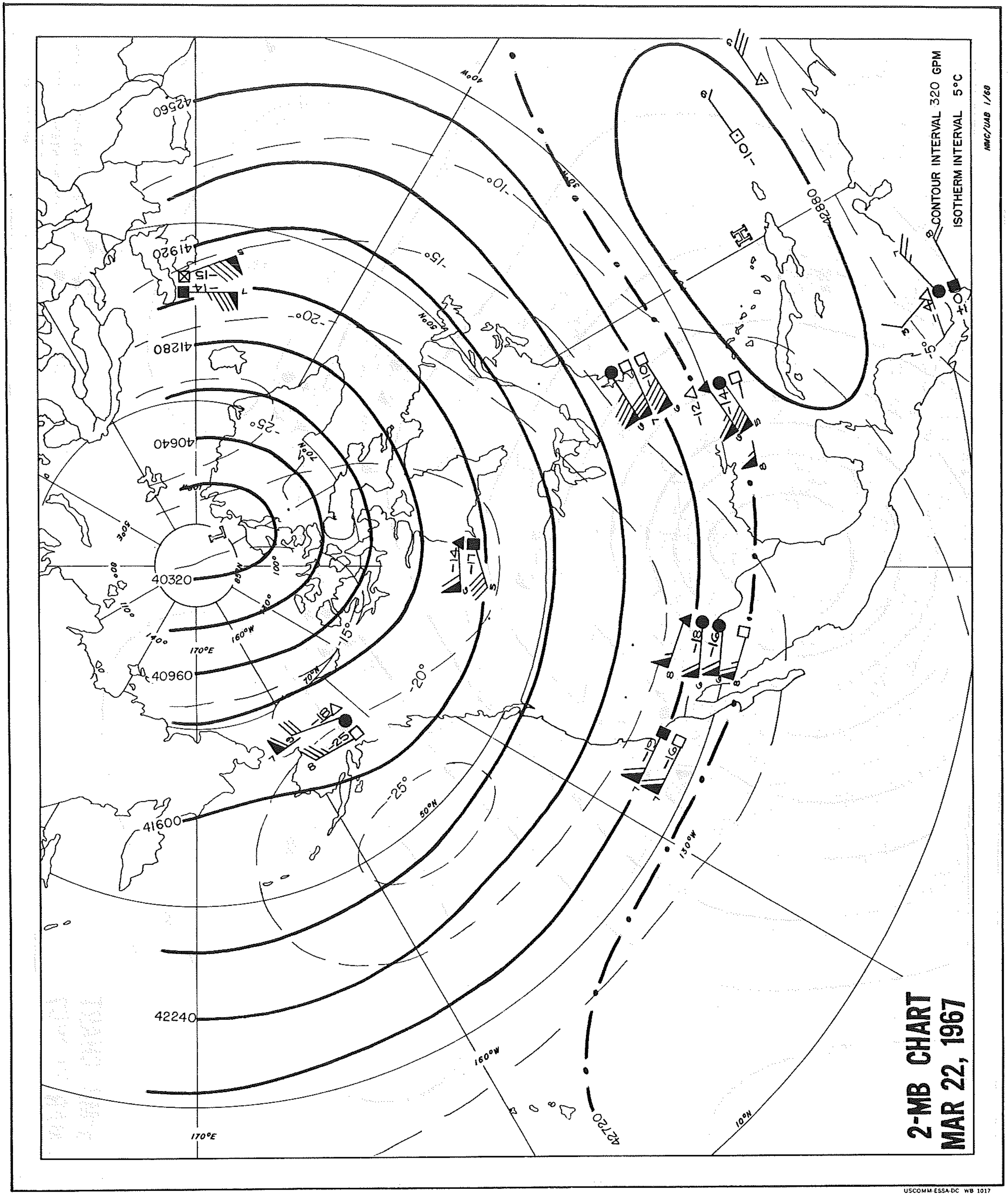


2-MB CHART
MAR 15, 1967

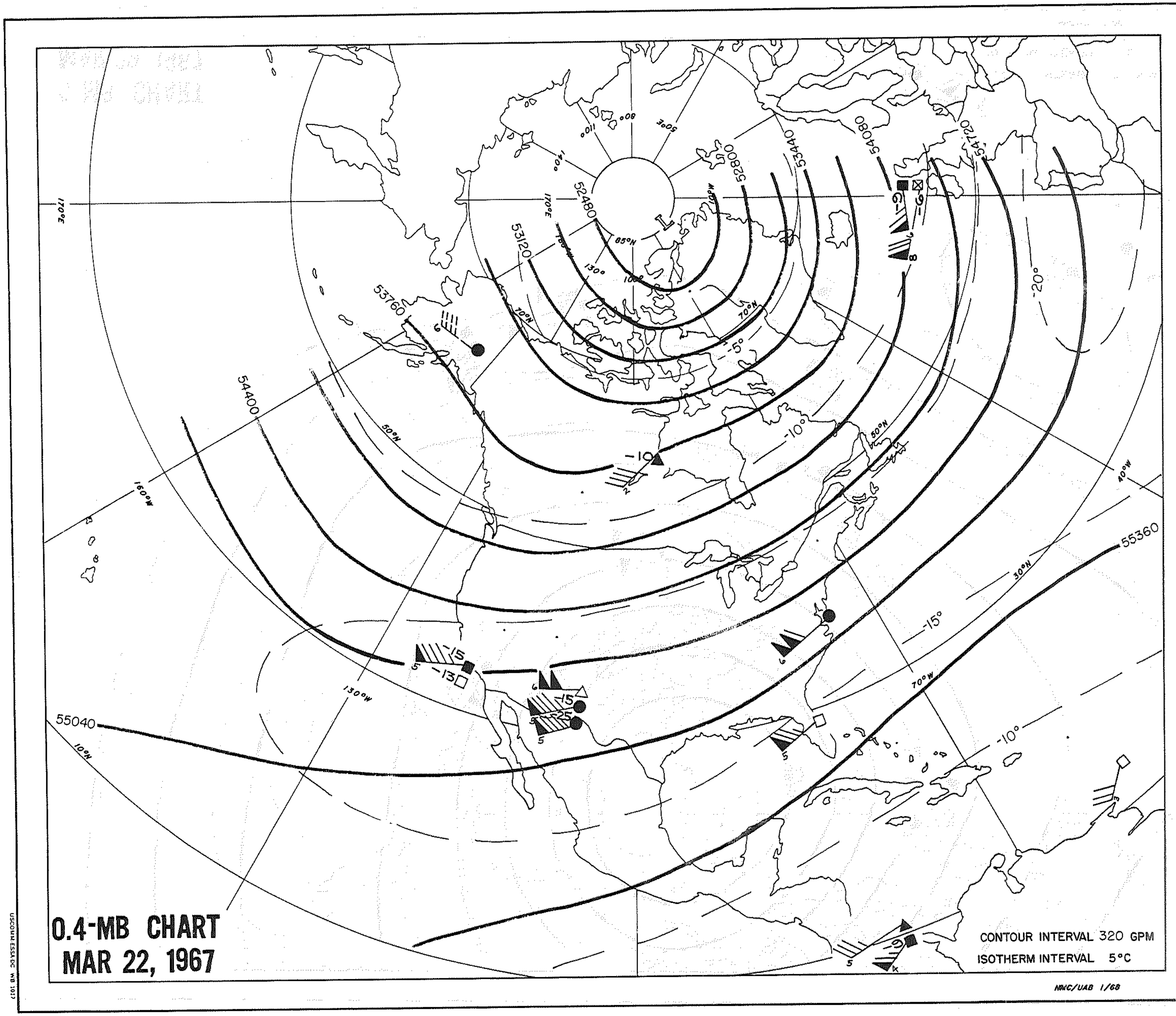
USCOMM-ESSA-DC WB 1017

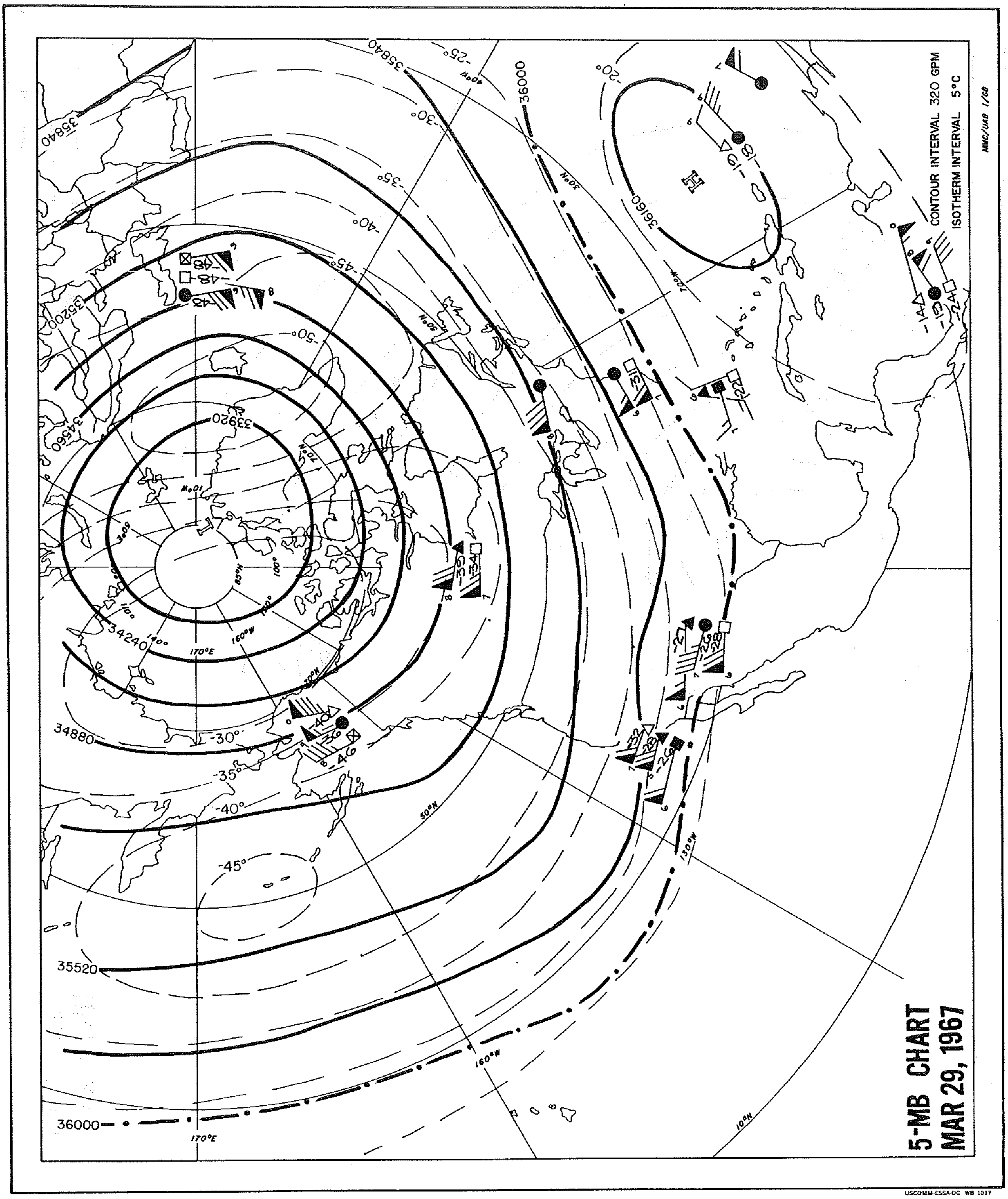

0.4-MB CHART
MAR 15, 1967
CONTOUR INTERVAL 320 GPM
ISOTHERM INTERVAL 5°C
54400
55040
53760
53120
52480
52160
52800
53440
54080
54720
55040
54720
-20°
-15°
-10°
-5°
USCOMM-ESSA-DC WB 1017

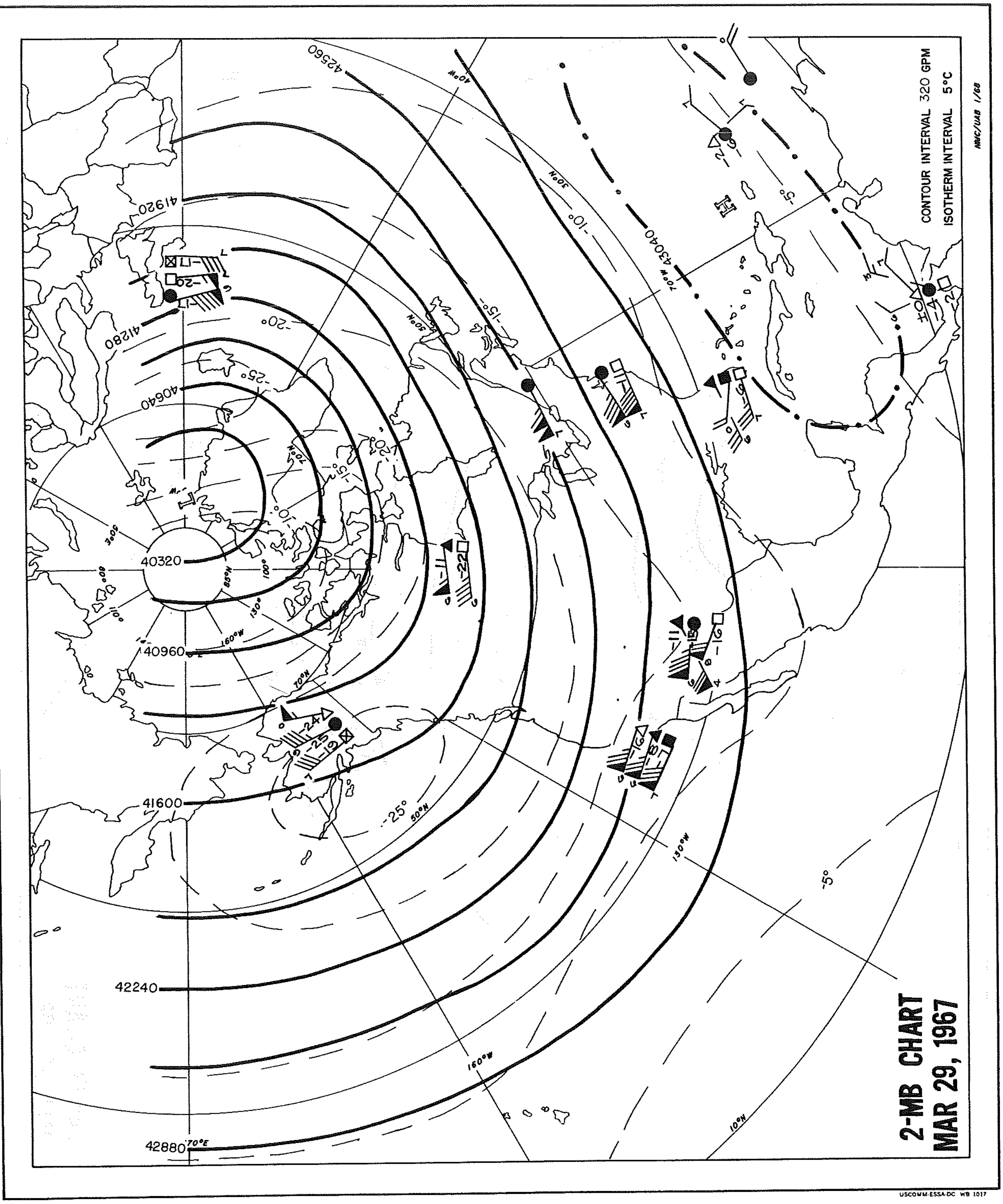

5-MB CHART
MAR 22, 1967
CONTOUR INTERVAL 320 GPM
ISOTHERM INTERVAL 5°C
33600
33920
34240
34560
34880
35200
35520
35840
36000
USCOMM ESSA-DC WB 1017



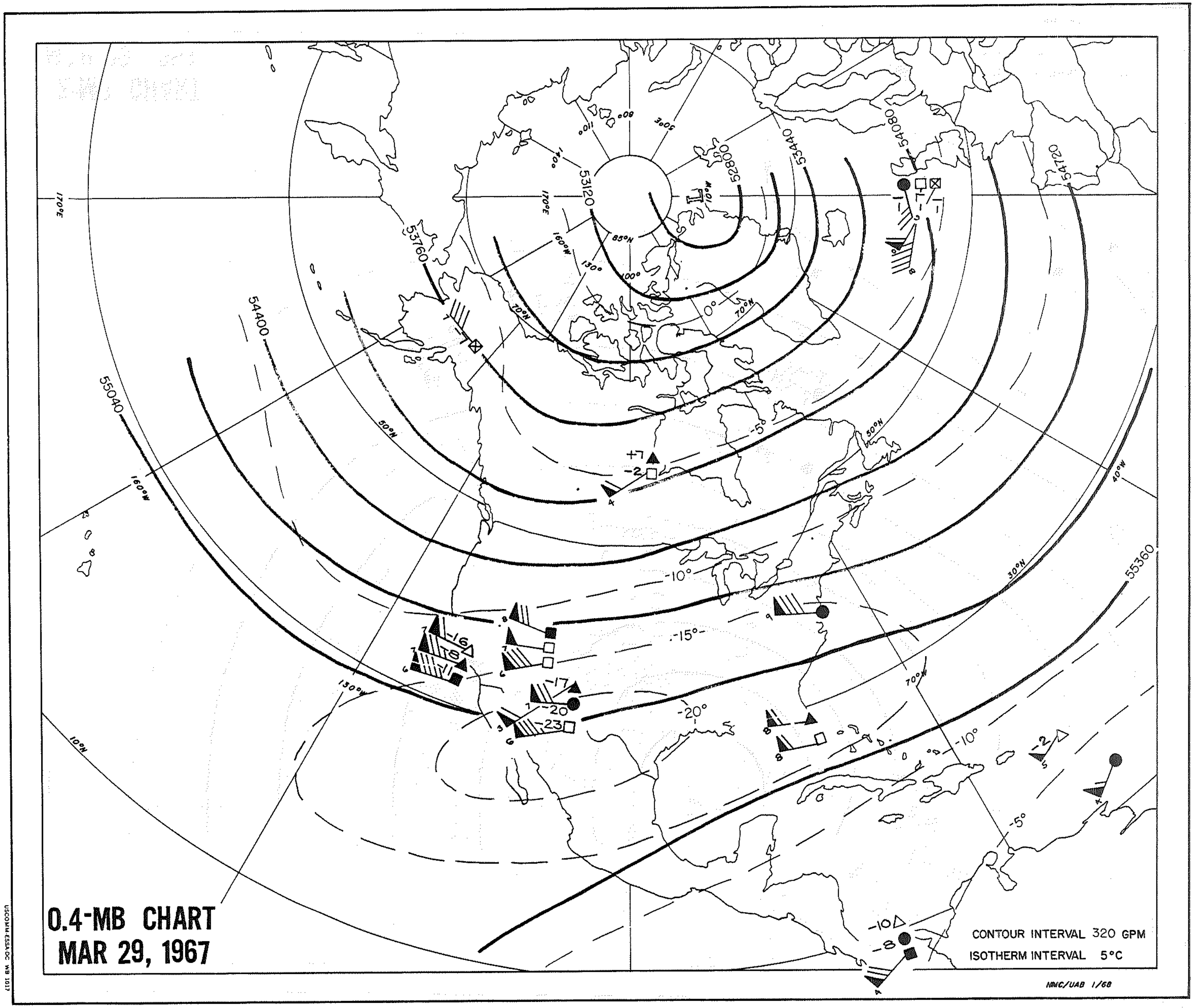
USCOMM-ESSA-DC WB 1017


0.4-MB CHART
MAR 22, 1967
CONTOUR INTERVAL 320 GPM
ISOTHERM INTERVAL 5°C
52480
52800
53120
53440
53760
54080
54400
54720
55040
55360
-5°
-10°
-15°
-20°
L
NMC/UAB 1/68

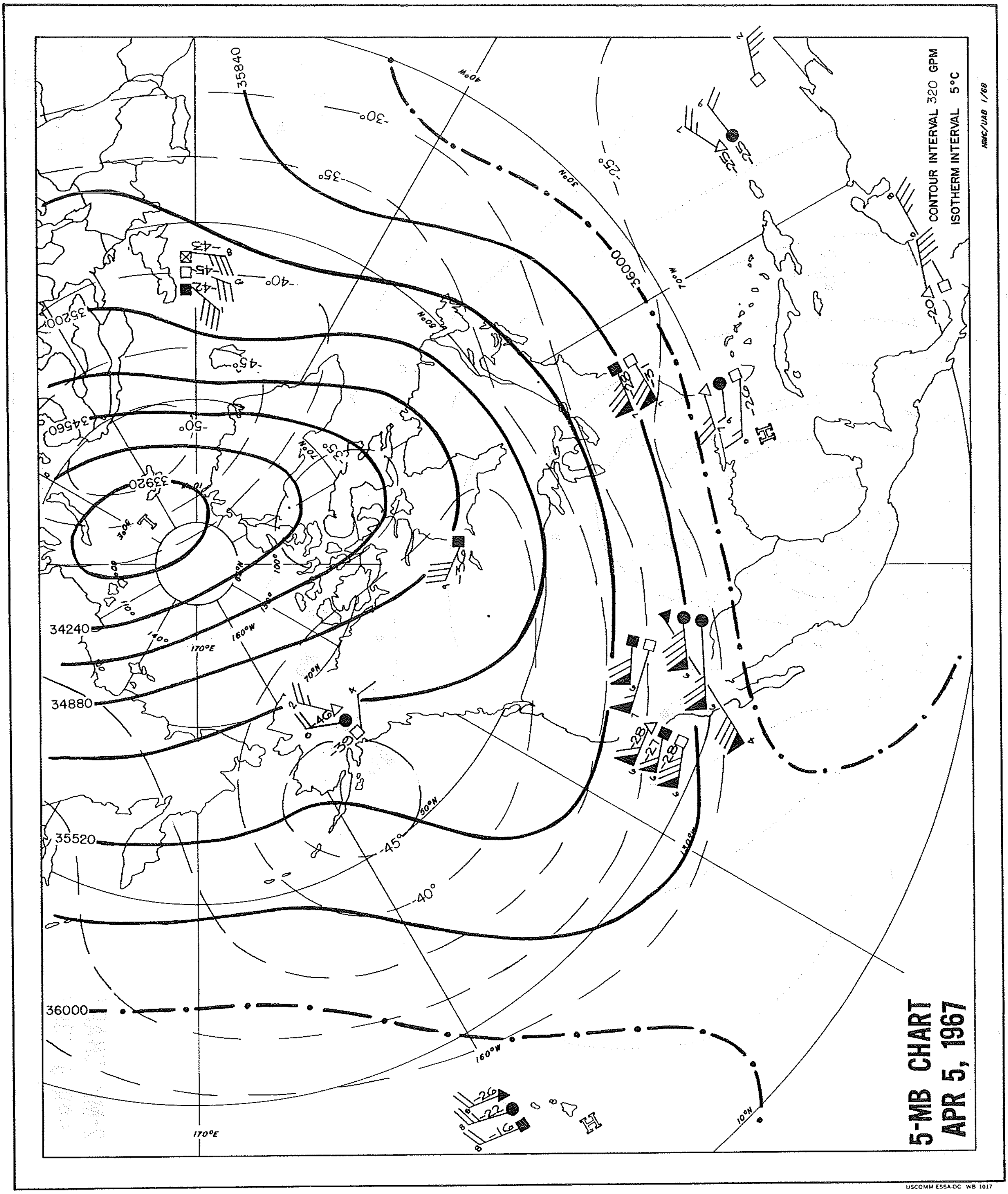

5-MB CHART
MAR 29, 1967
CONTOUR INTERVAL 320 GPM
ISOTHERM INTERVAL 5°C
36000
35520
34880
34240
33920
34560
35200
35840
36160
H
L
-30°
-35°
-40°
-45°
-50°
-25°
-20°
USCOMM-ESSA-DC WB 1017



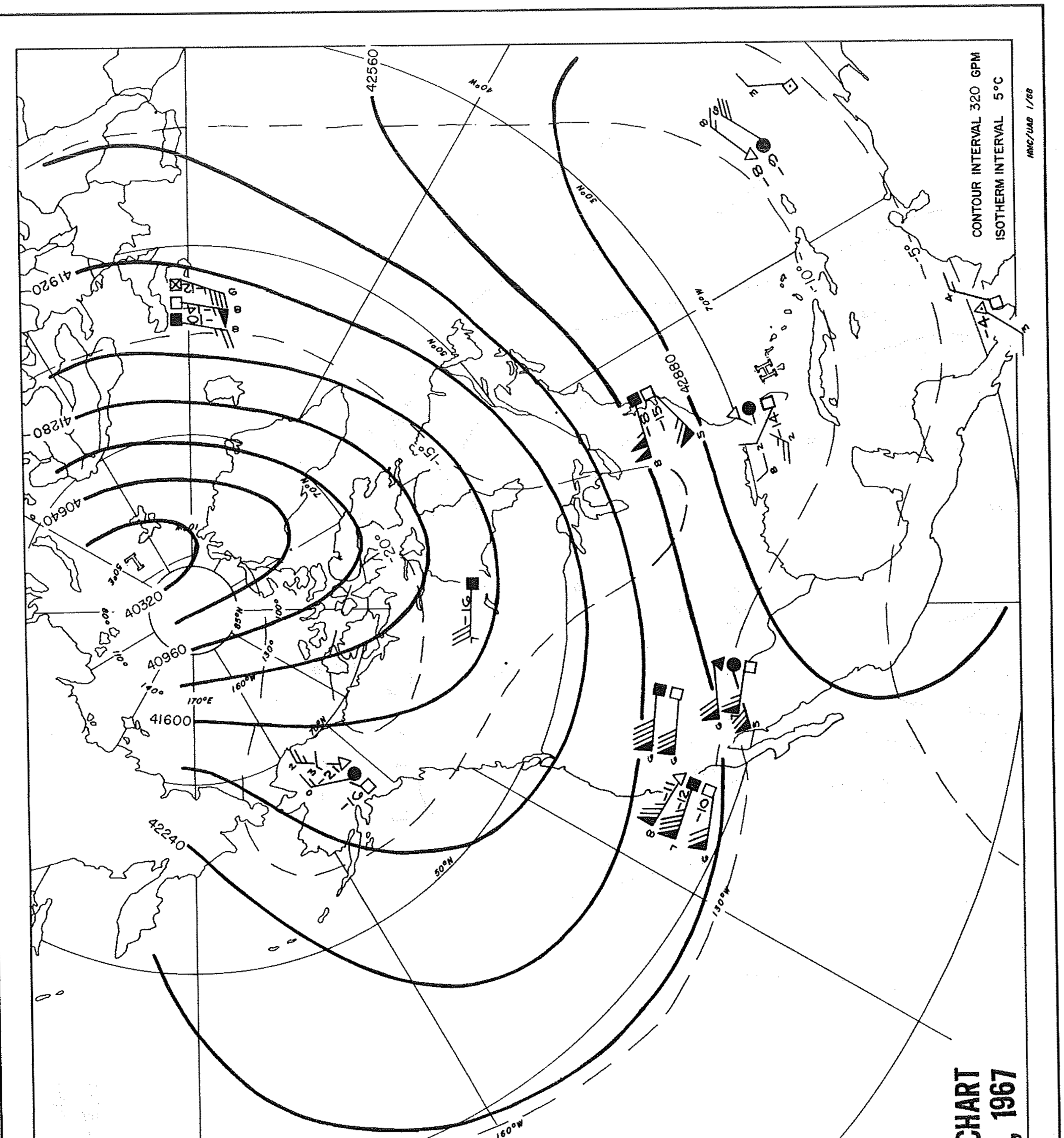
USCOMM-ESSA-DC WB 1017

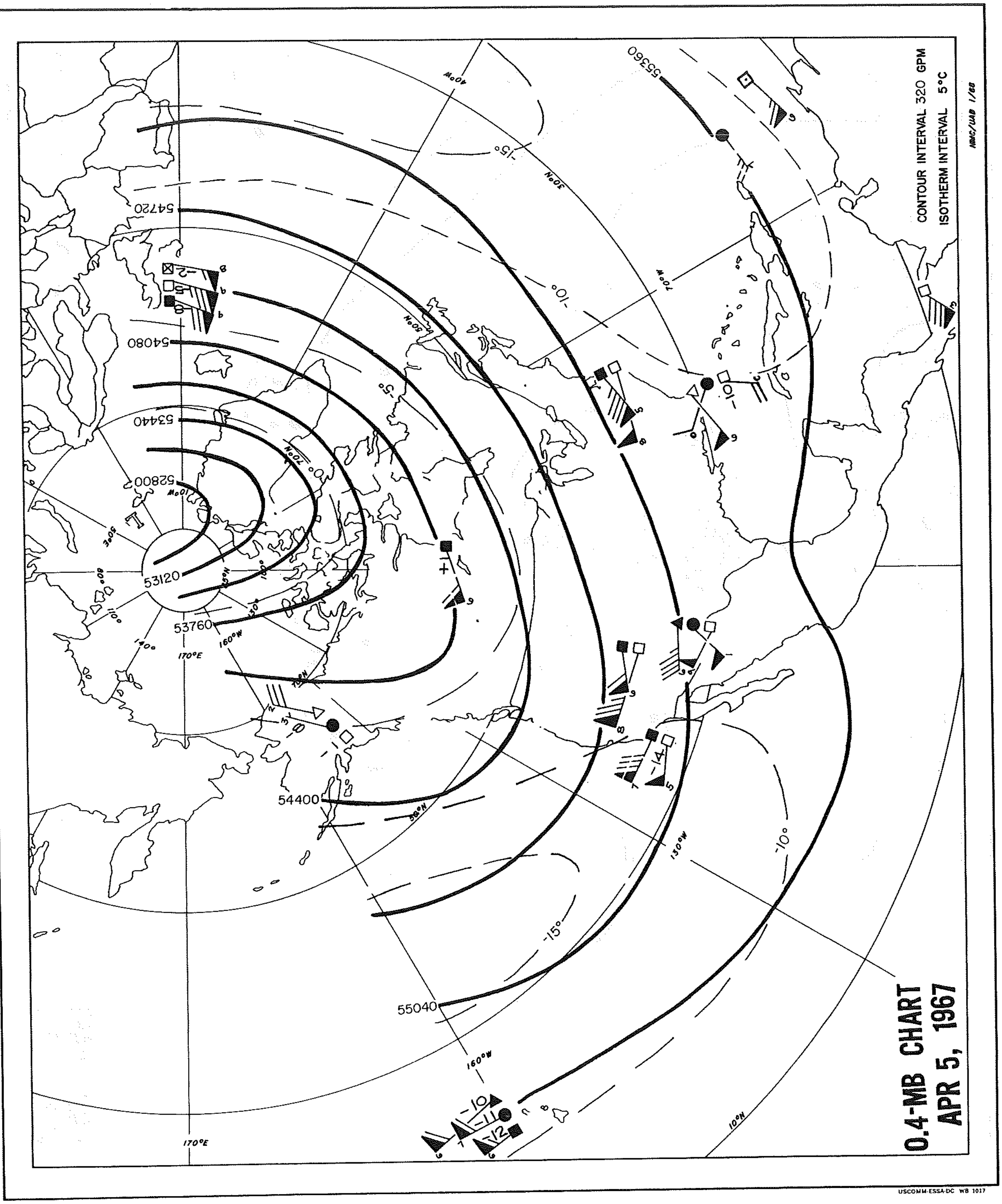


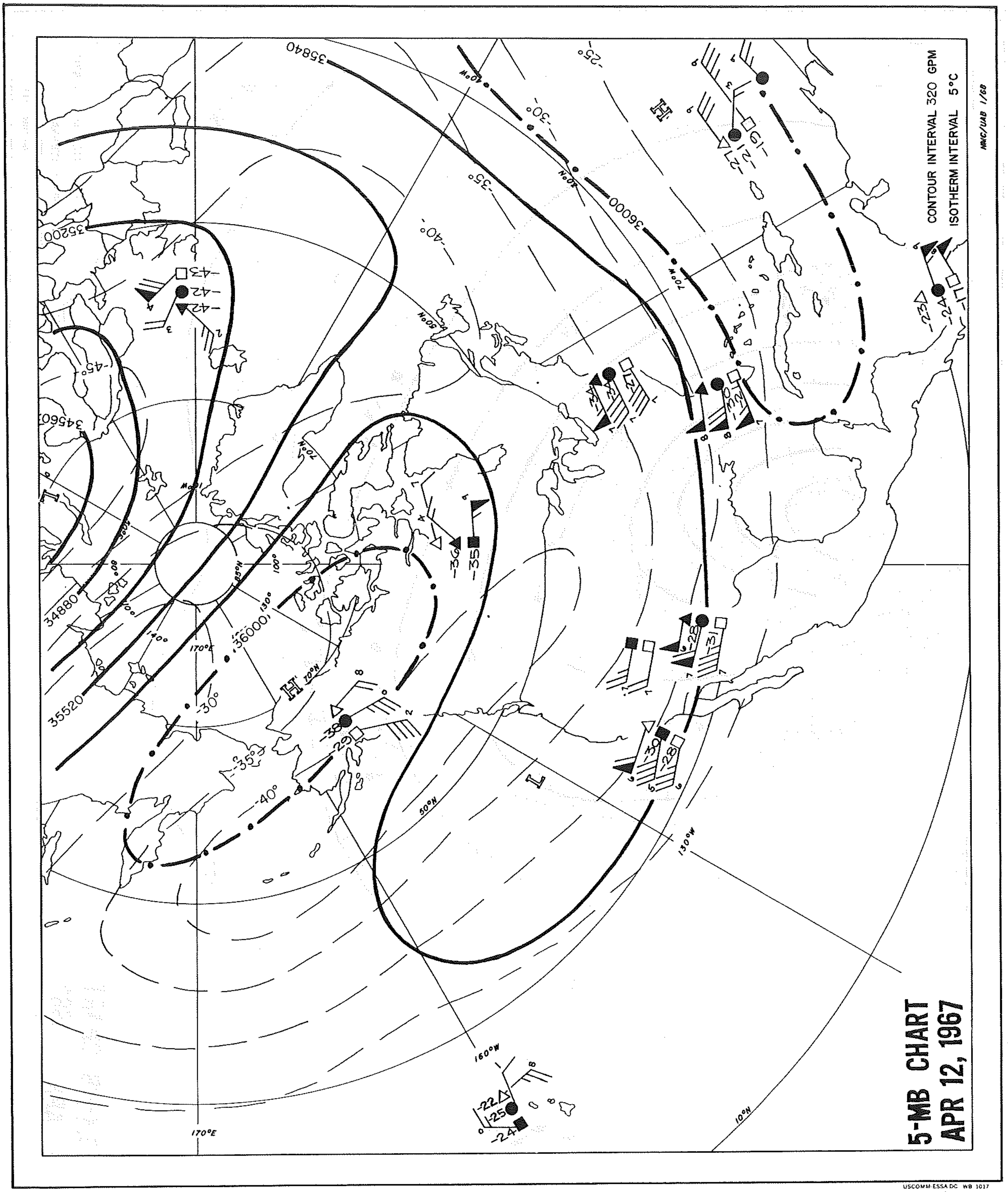
0.4-MB CHART
MAR 29, 1967

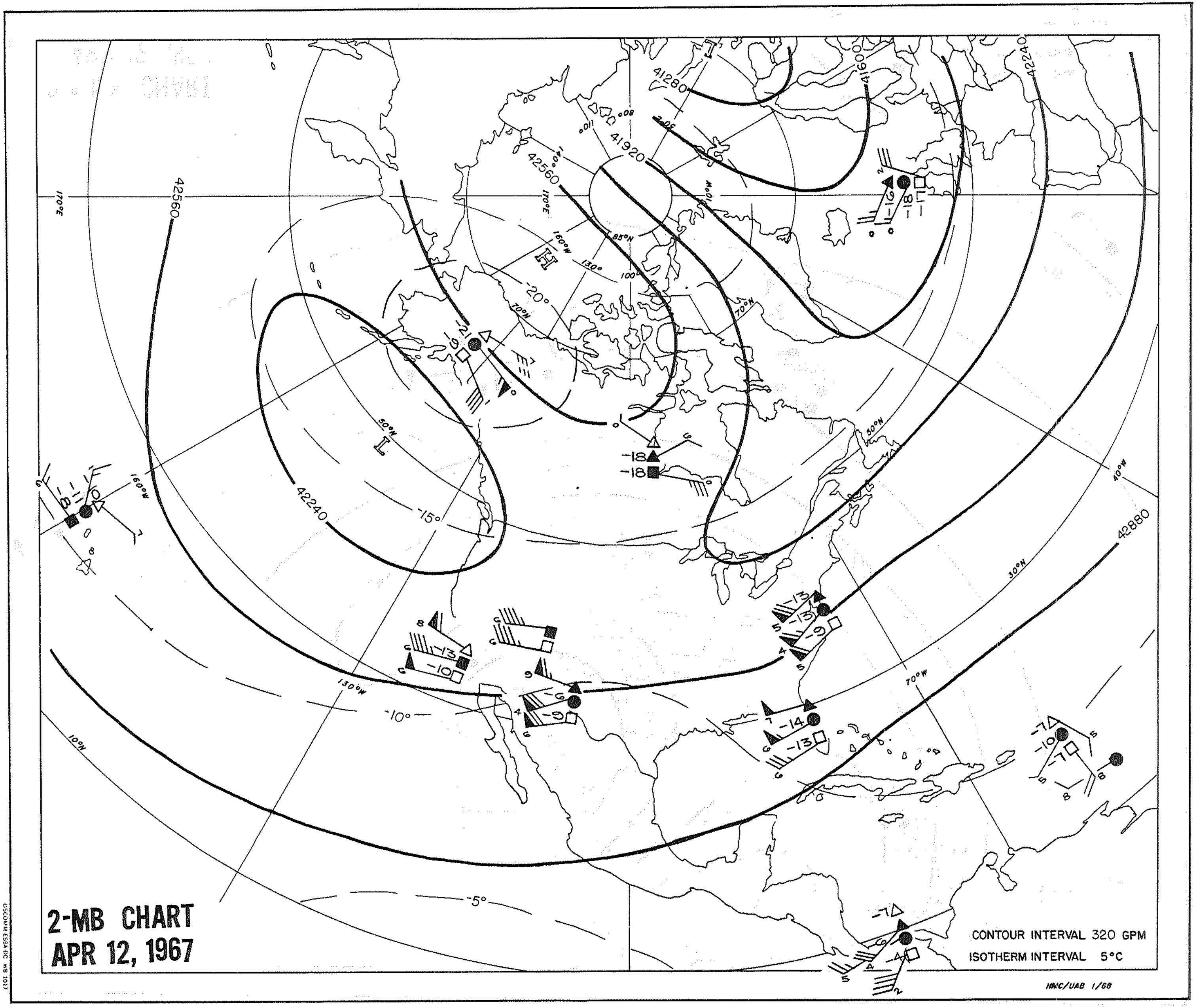


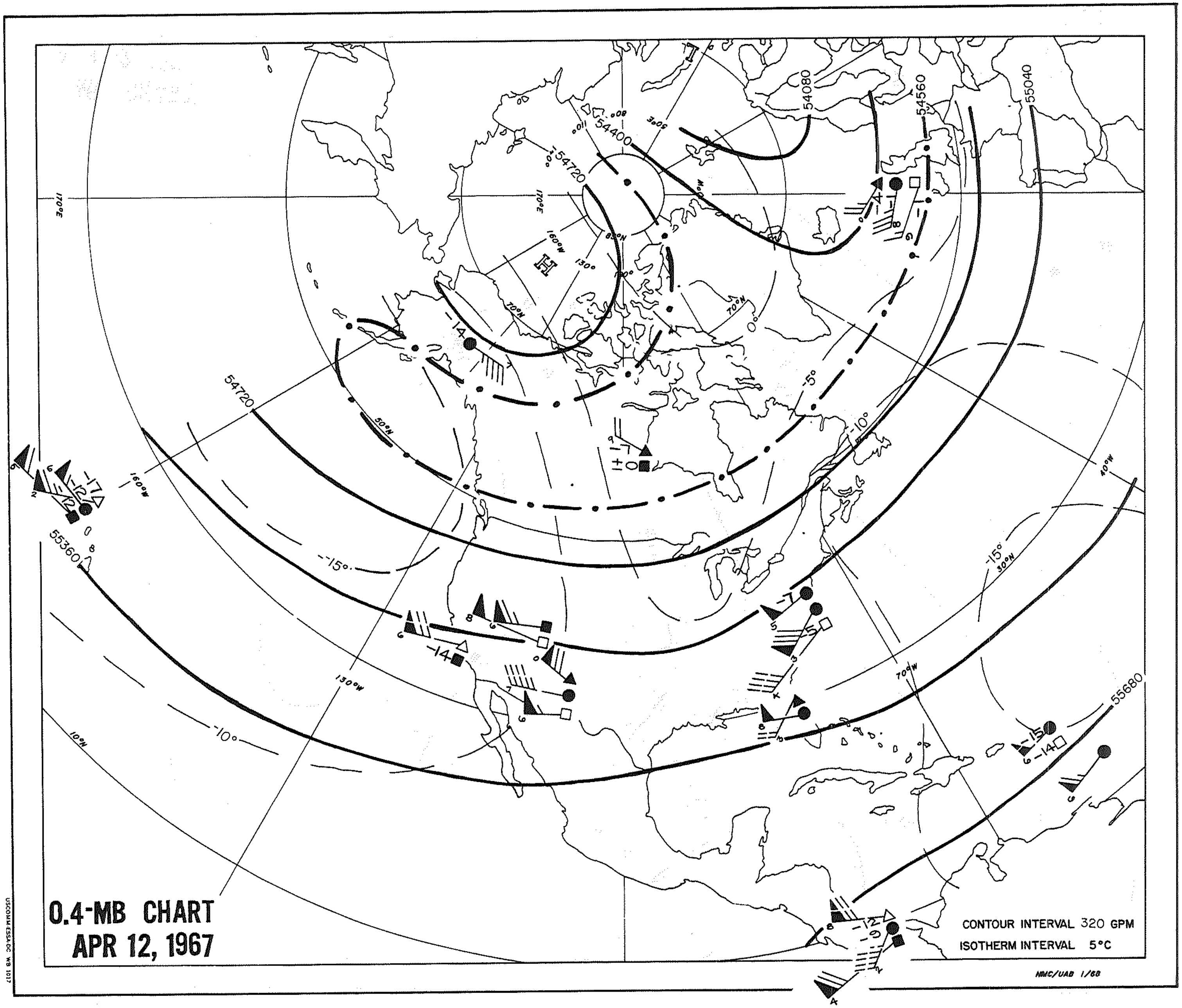
USCOMM ESSA DC WB 1017

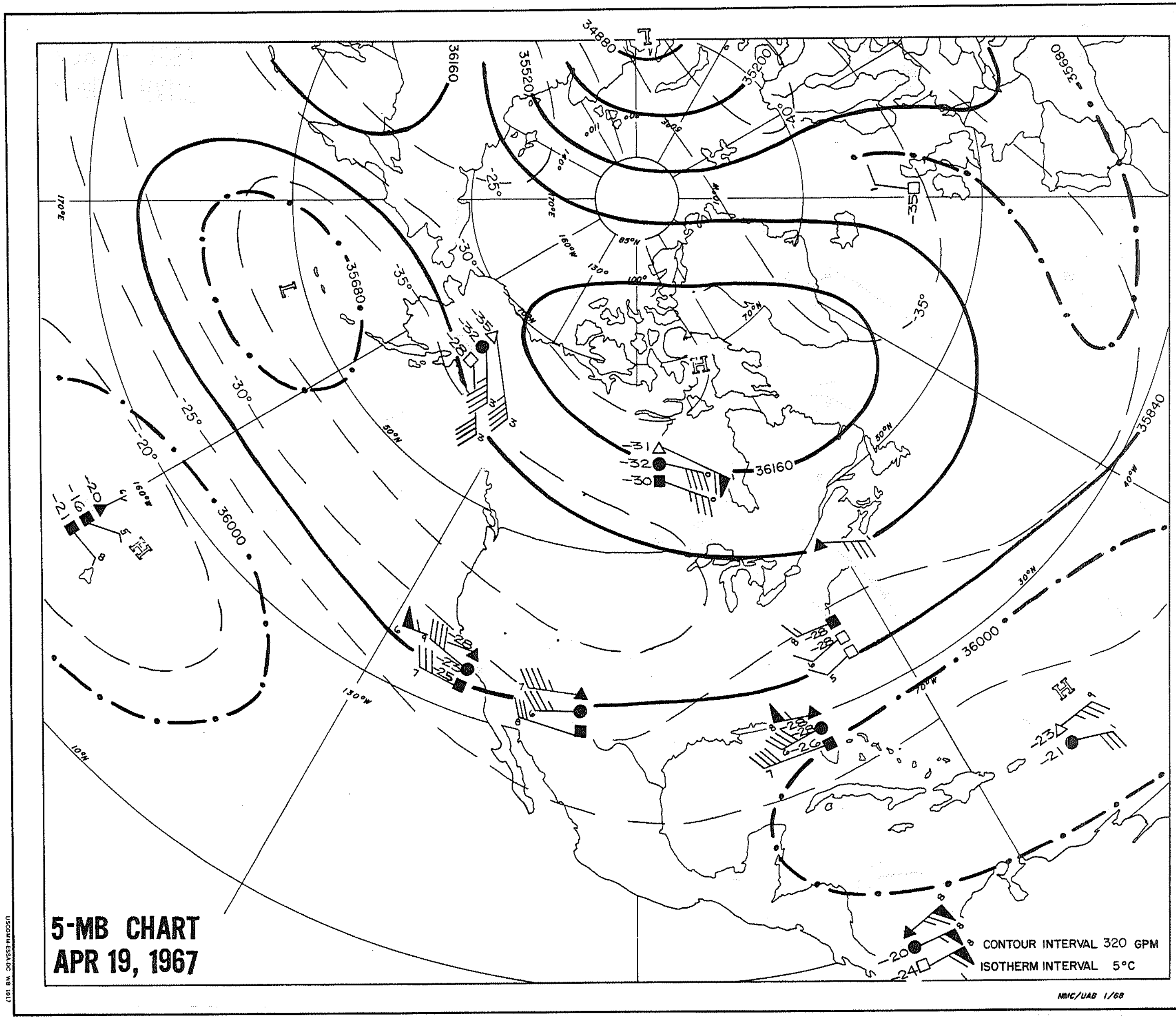

2-MB CHART
APR 5, 1967
CONTOUR INTERVAL 320 GPM
ISOTHERM INTERVAL 5°C
NMC/UAB 1/68
40320
40640
40960
41280
41600
41920
42240
42560
42880
USCOMM-ESSA-DC WB 1017

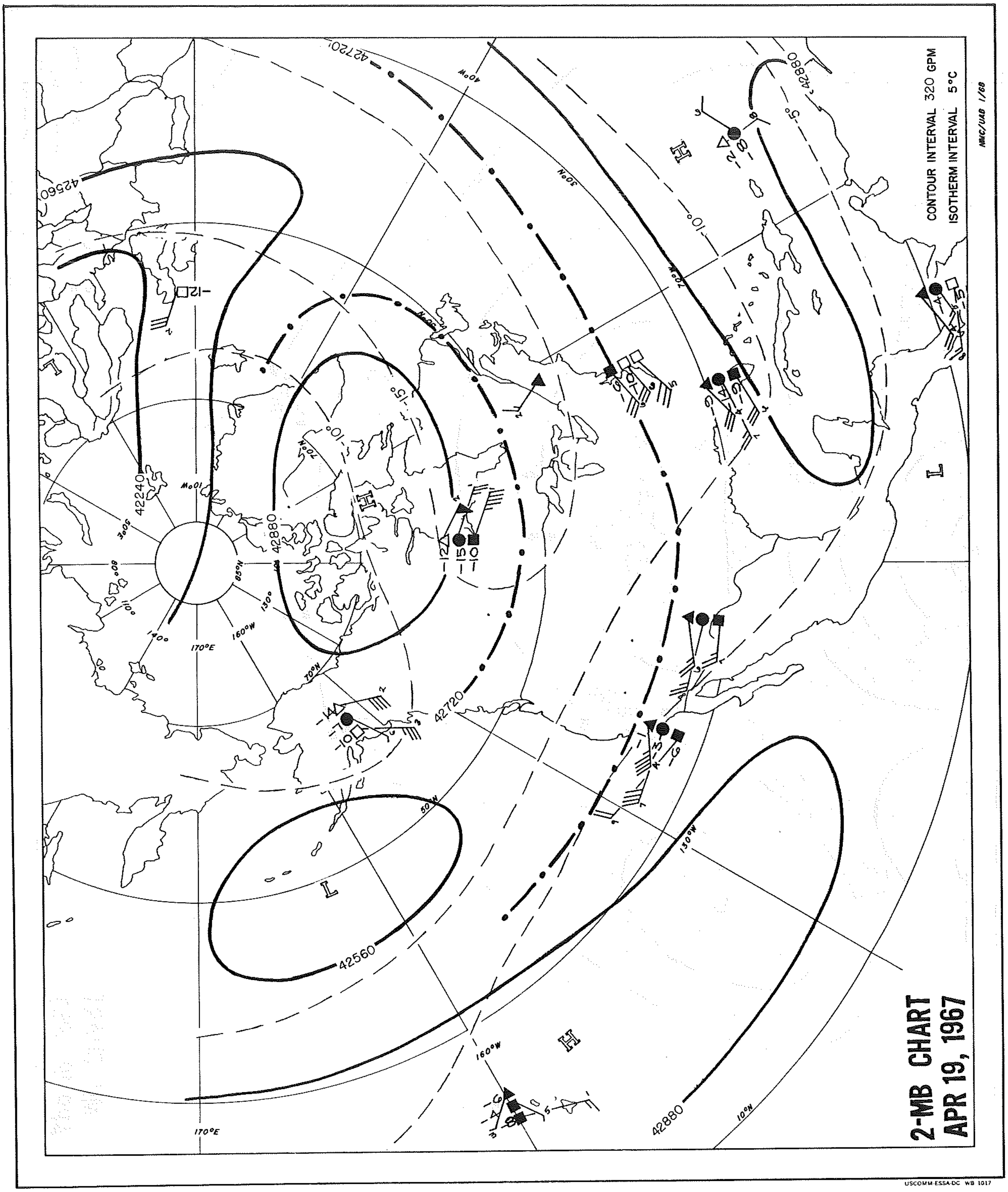

0.4-MB CHART
APR 5, 1967
CONTOUR INTERVAL 320 GPM
ISOTHERM INTERVAL 5°C
52800
53120
53440
53760
54080
54400
54720
55040
55360
-15°
-10°
-5°
USCOMM-ESSA-DC WB 1017

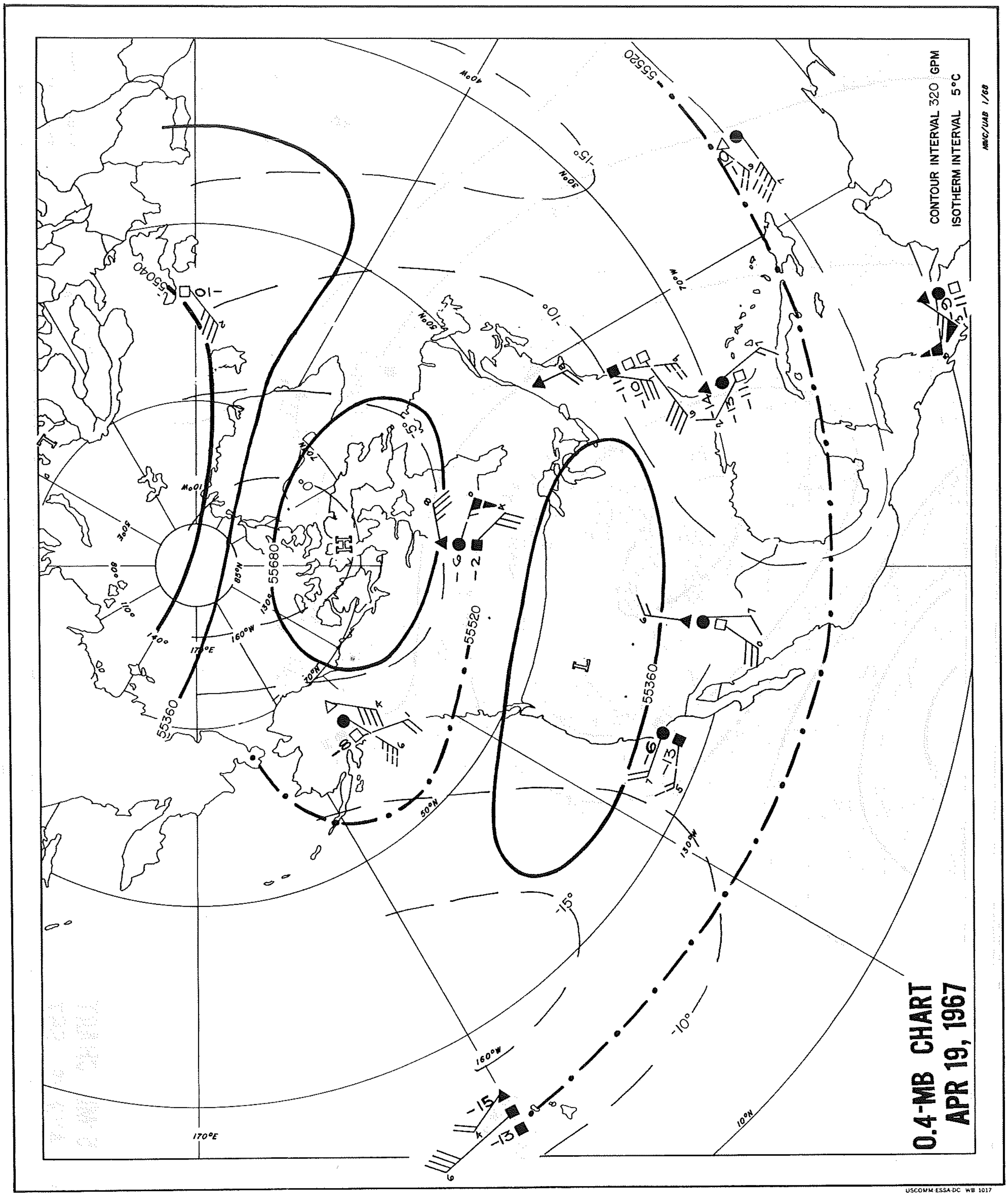

5-MB CHART
APR 12, 1967
CONTOUR INTERVAL 320 GPM
ISOTHERM INTERVAL 5°C
35840
36000
35200
34560
34880
35520
USCOMM-ESSA DC WB 1017

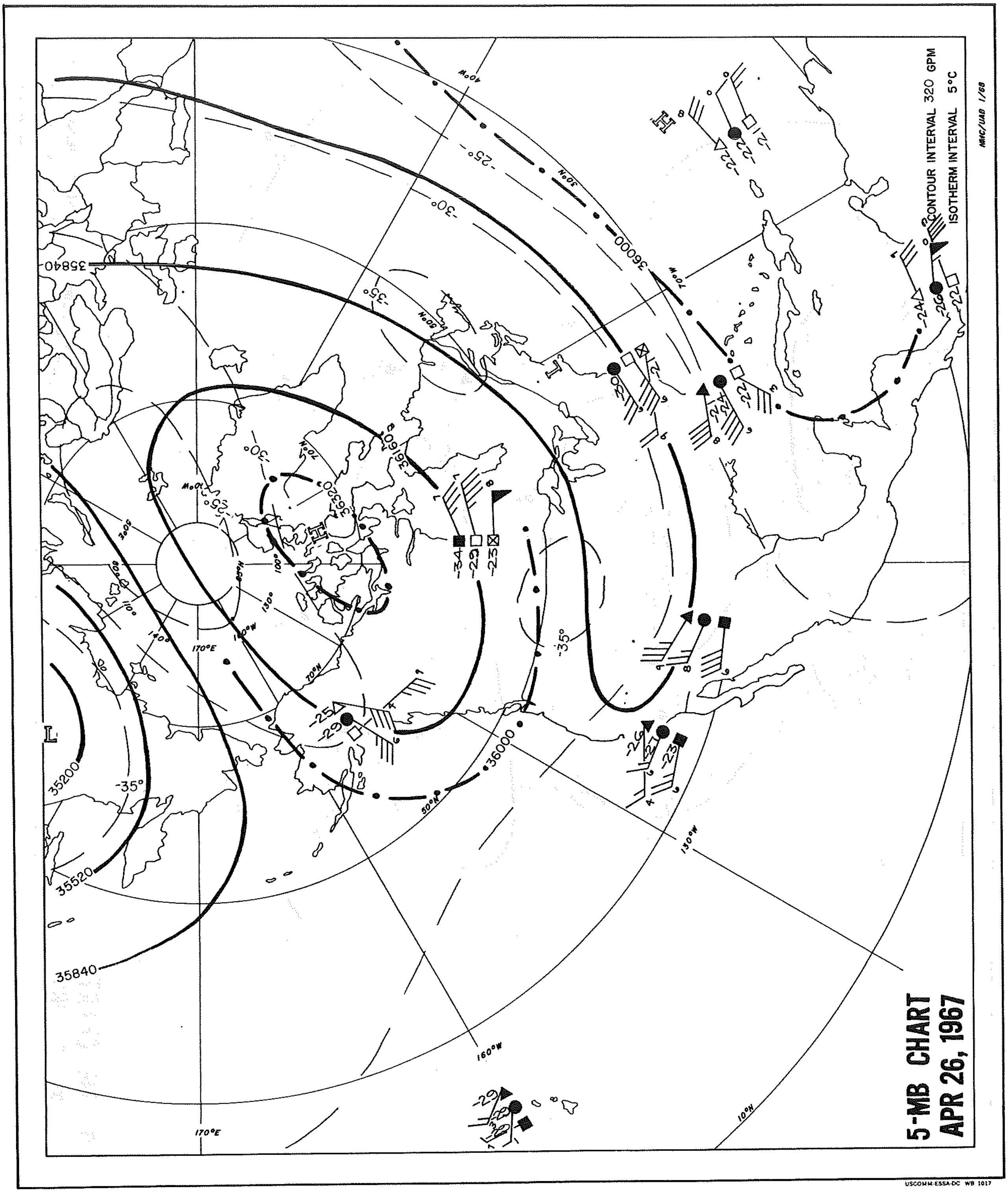

2-MB CHART
APR 12, 1967
CONTOUR INTERVAL 320 GPM
ISOTHERM INTERVAL 5°C
NMC/UAB 1/68
42880
42560
42240
41920
41600
41280
-20°
-15°
-10°
-5°

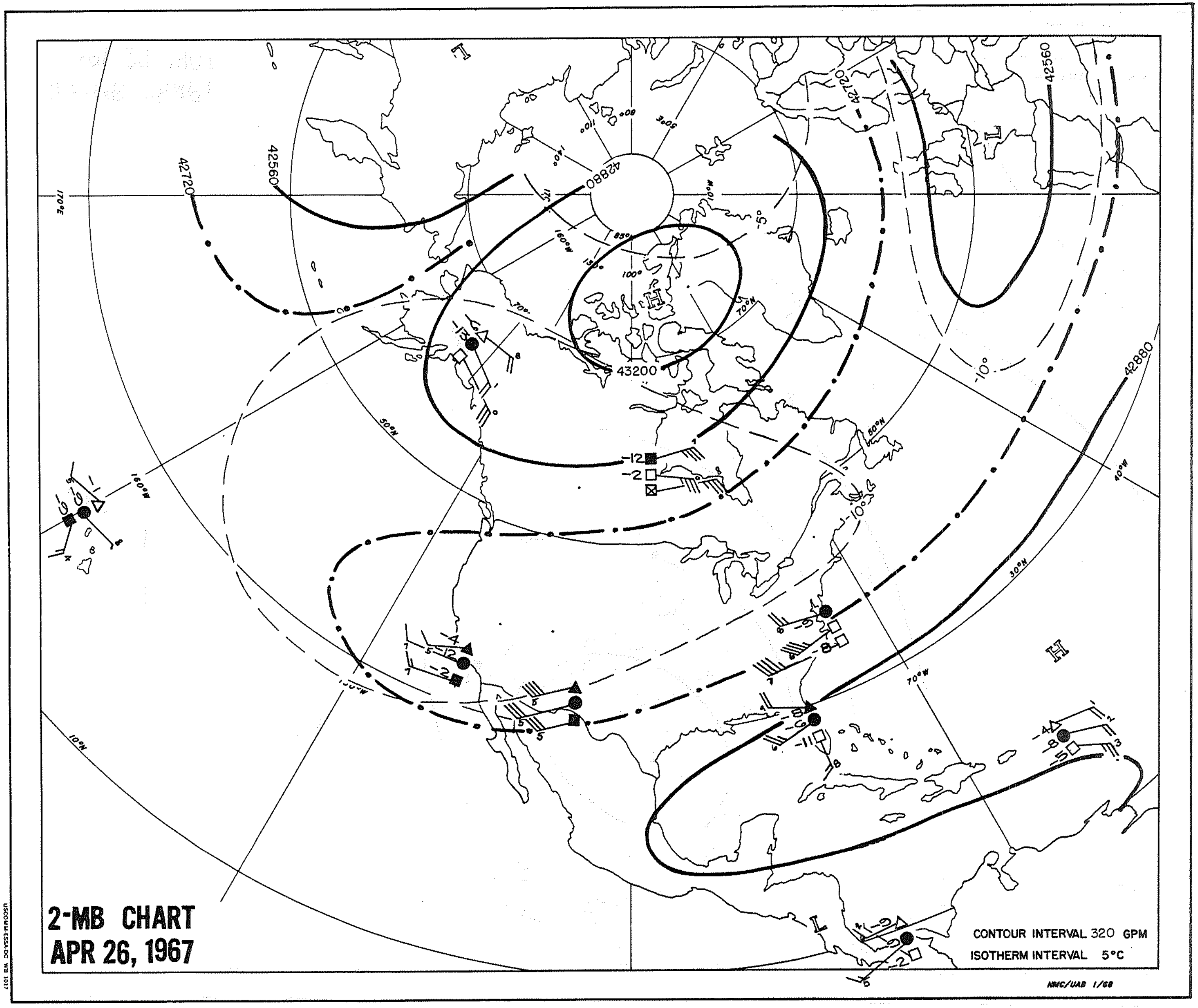

0.4-MB CHART
APR 12, 1967
CONTOUR INTERVAL 320 GPM
ISOTHERM INTERVAL 5°C
NMC/UAB 1/68
USCOMM-ESSA-DC WB 1017
54080
54560
55040
54400
54720
54720
55360
55680
H
-15°
-10°
0°
-5°
-10°
-15°
130°W
70°W
40°W
10°N
30°N
50°N
70°N
80°N
170°E
160°W


5-MB CHART
APR 19, 1967
CONTOUR INTERVAL 320 GPM
ISOTHERM INTERVAL 5°C
NMC/UAB 1/68
USCOMM-ESSA-DC WB 1017

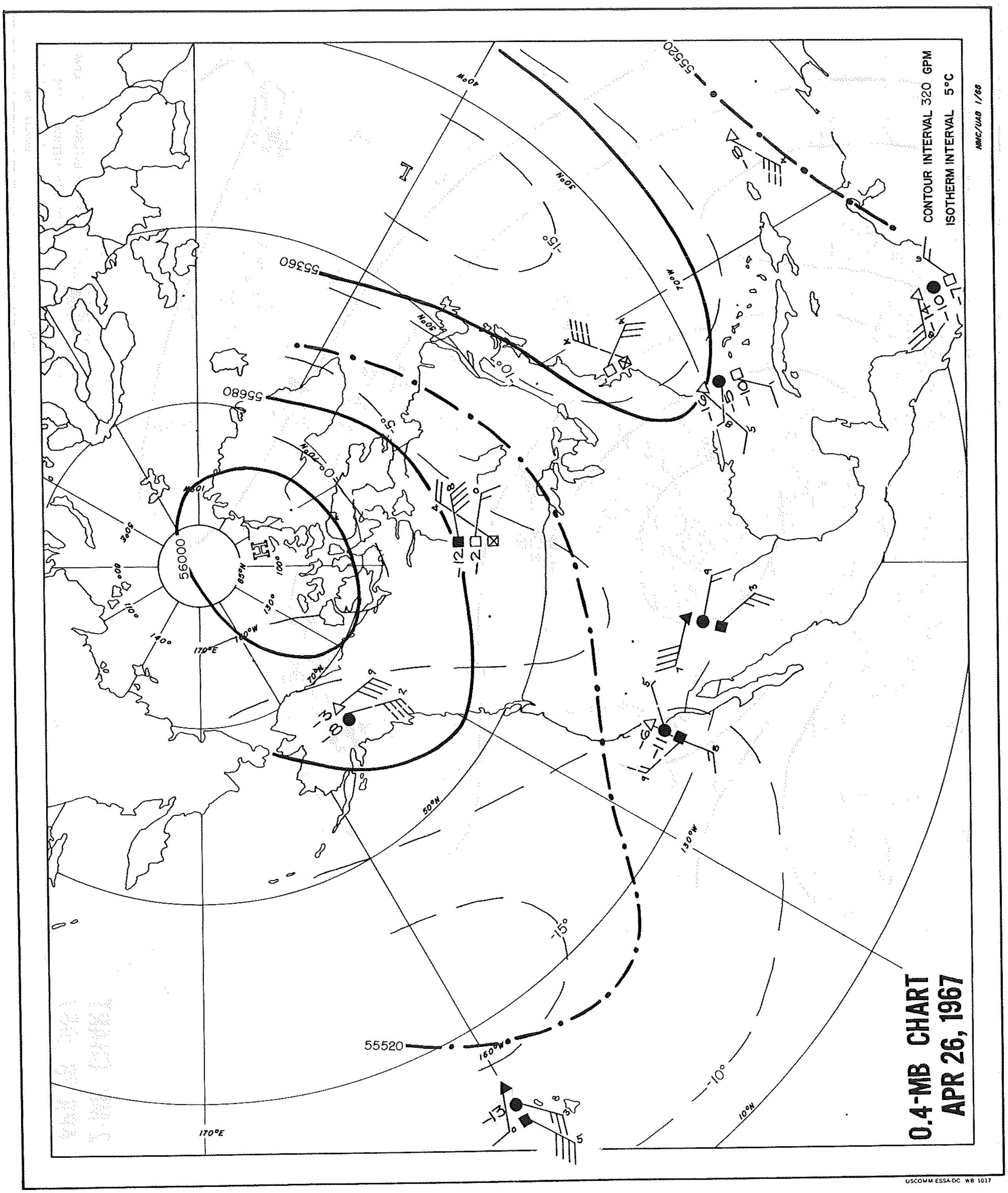

2-MB CHART
APR 19, 1967
CONTOUR INTERVAL 320 GPM
ISOTHERM INTERVAL 5°C
42240
42560
42720
42880
L
H


0.4-MB CHART
APR 19, 1967
CONTOUR INTERVAL 320 GPM
ISOTHERM INTERVAL 5°C
55040
55680
55520
55360
H
L
-15°
-10°
USCOMM-ESSA-DC WB 1017

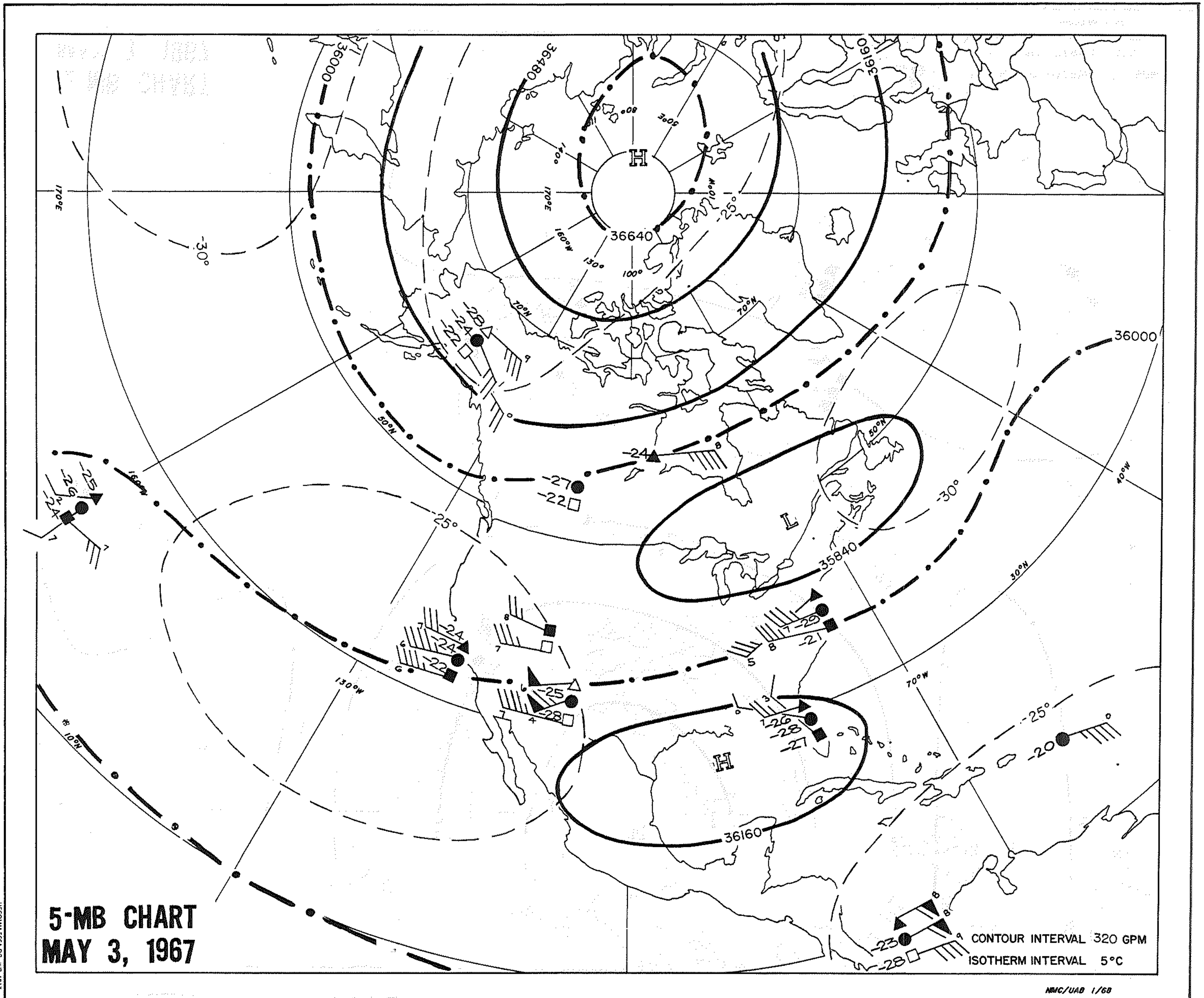

5-MB CHART
APR 26, 1967
CONTOUR INTERVAL 320 GPM
ISOTHERM INTERVAL 5°C
35840
35520
35200
36000
36160
36320
-35°
-30°
-25°
160°W
130°W
170°E
10°N
USCOMM-ESSA-DC WB 1017



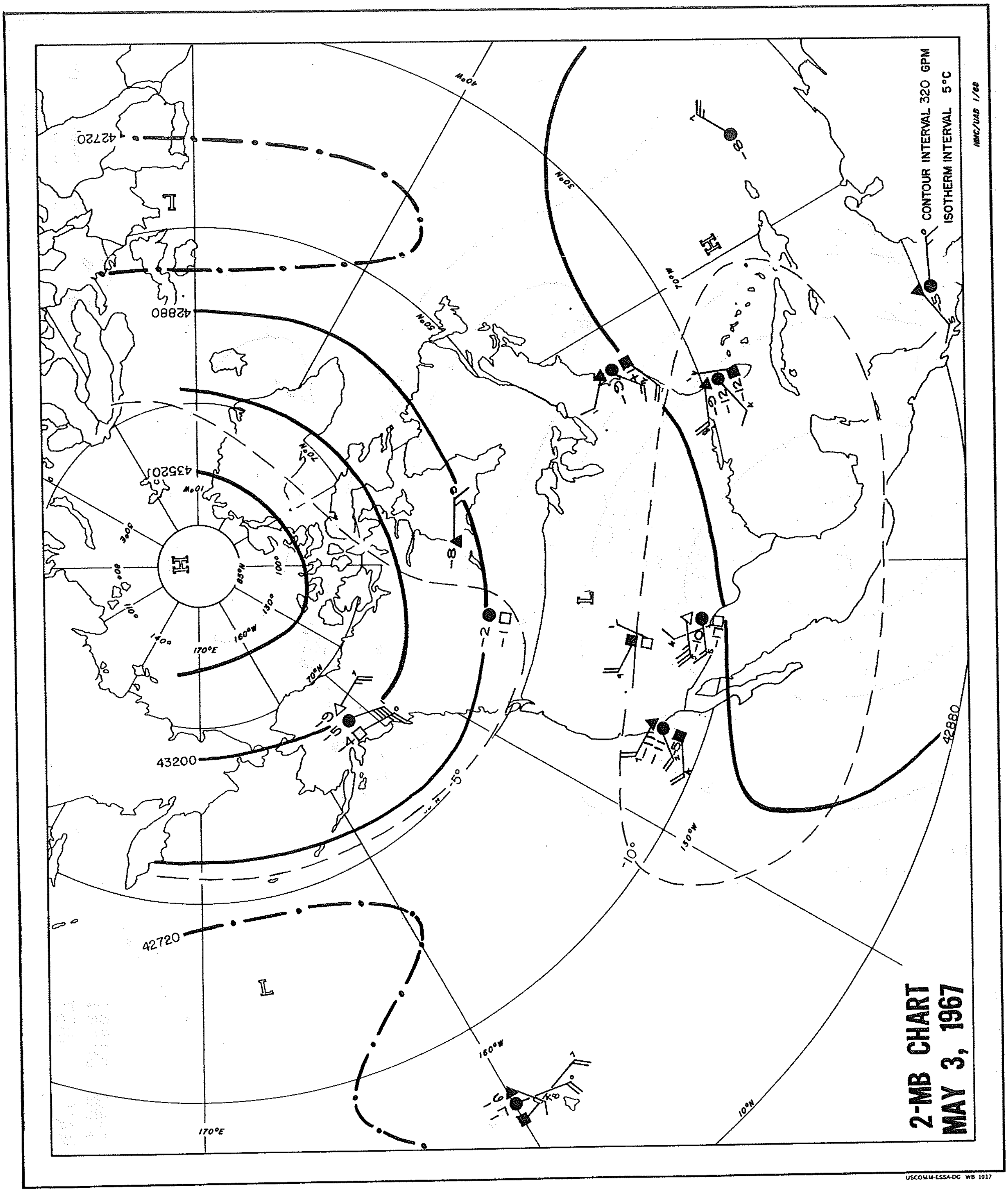
2-MB CHART
APR 26, 1967
CONTOUR INTERVAL 320 GPM
ISOTHERM INTERVAL 5°C
NMC/UAB 1/68



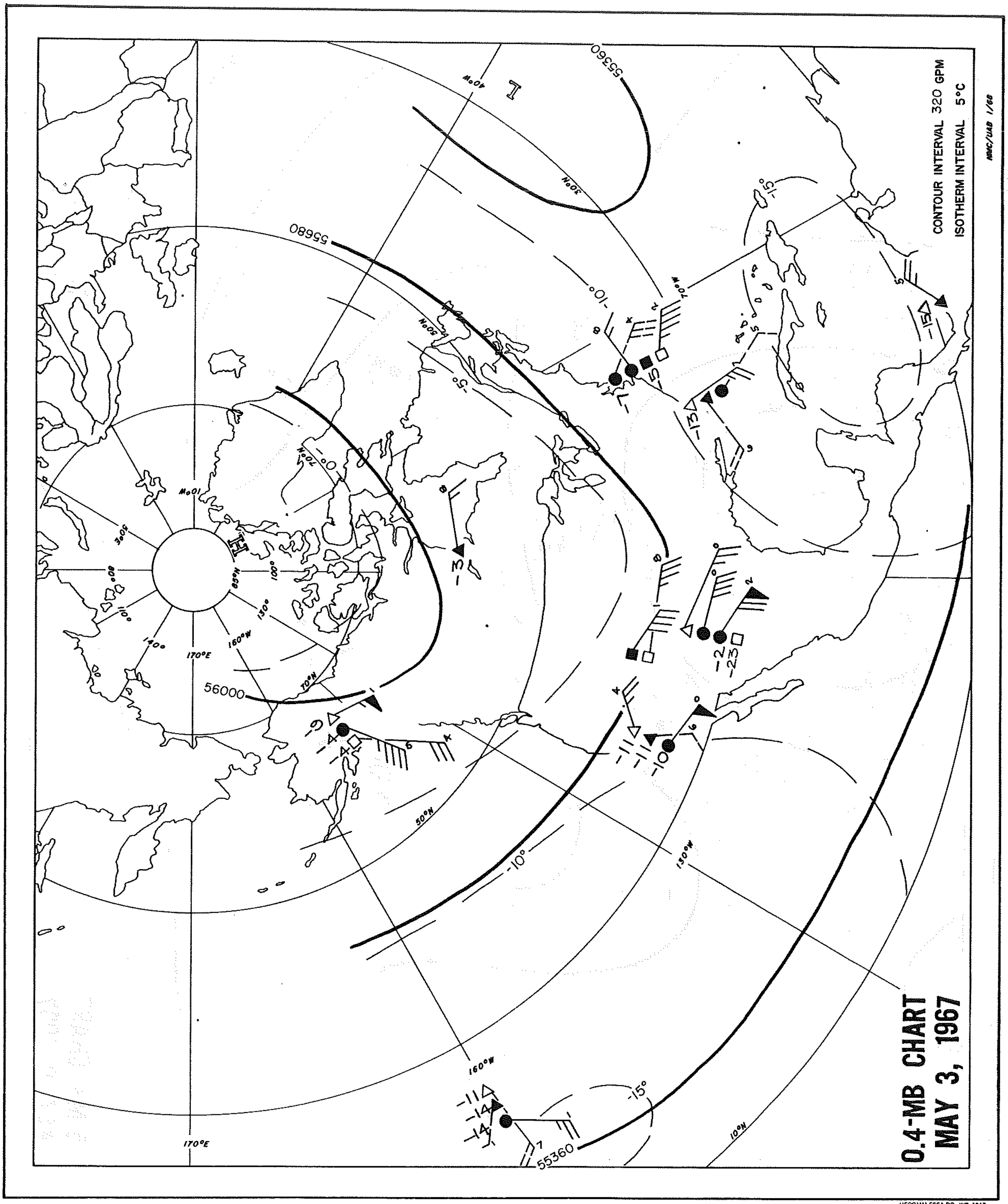
USCOMM-ESSA-DC WB 1017



5-MB CHART
MAY 3, 1967
CONTOUR INTERVAL 320 GPM
ISOTHERM INTERVAL 5°C
36000
36480
36640
36160
35840
36160
36000
H
L
H
-30°
-25°
-25°
-30°
-25°
70°N
50°N
30°N
10°N
130°W
70°W
40°W
NMC/UAB 1/68
USCOMM-ESSA-DC WB 1017



USCOMM-ESSA-DC WB 1017



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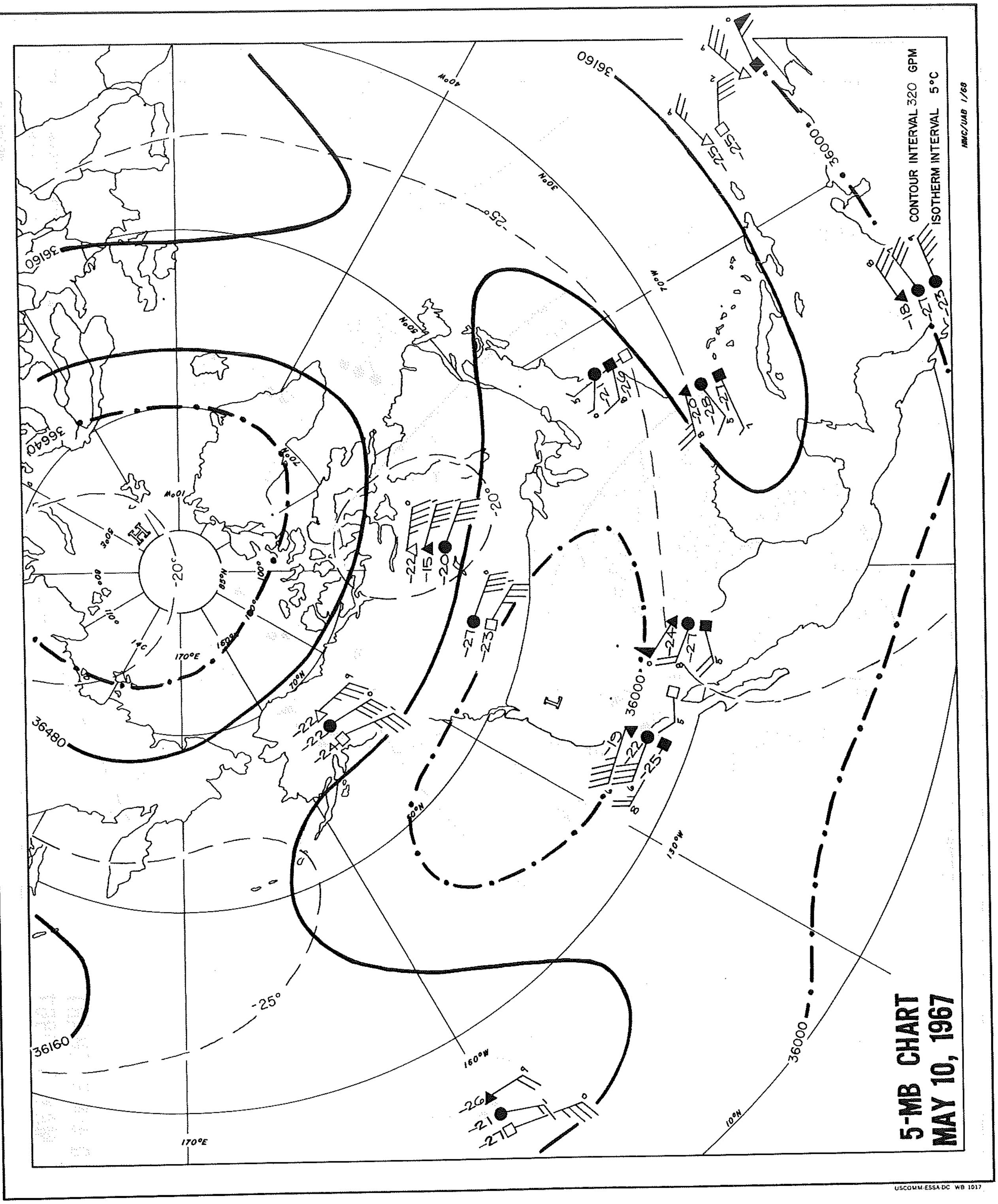
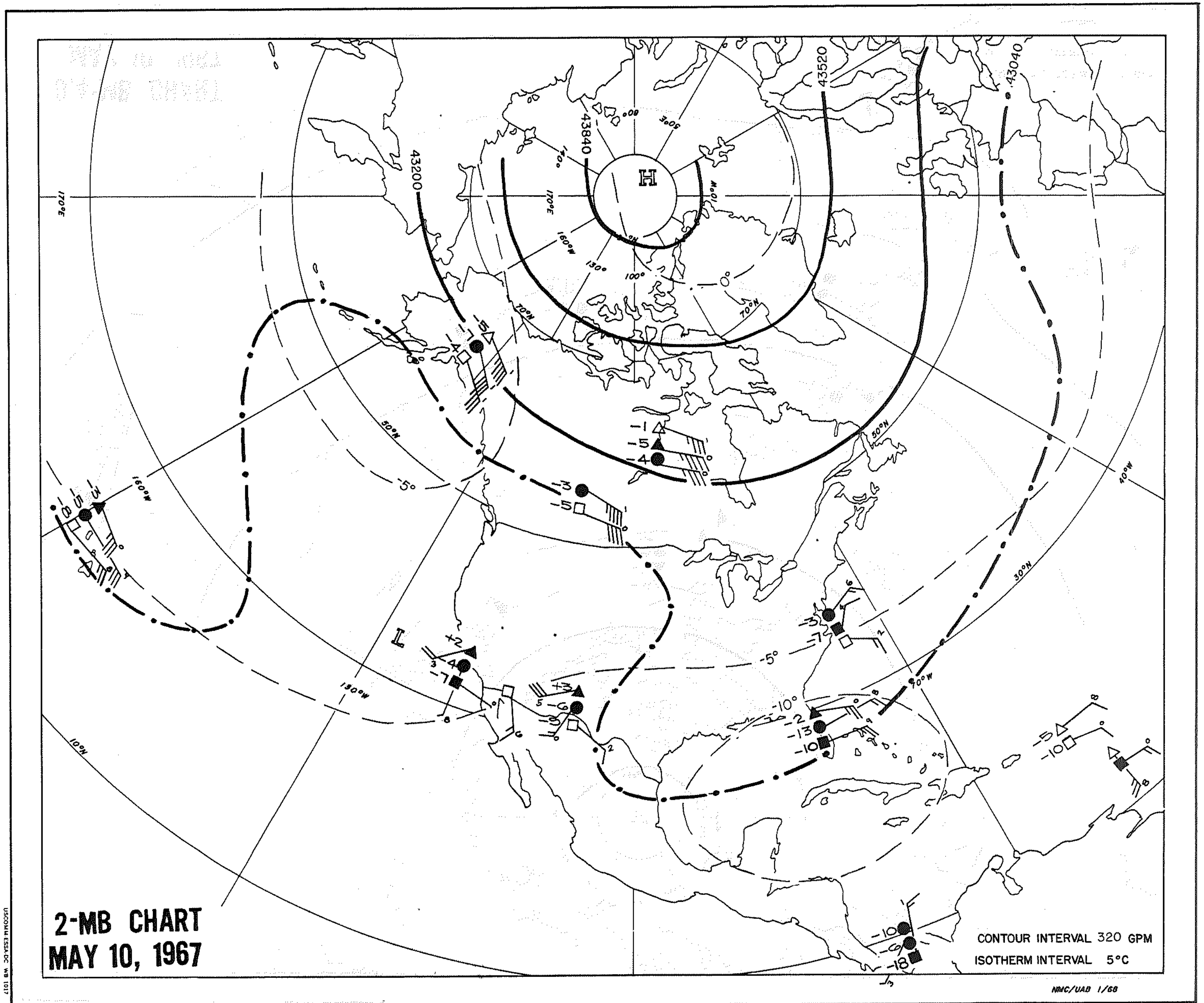
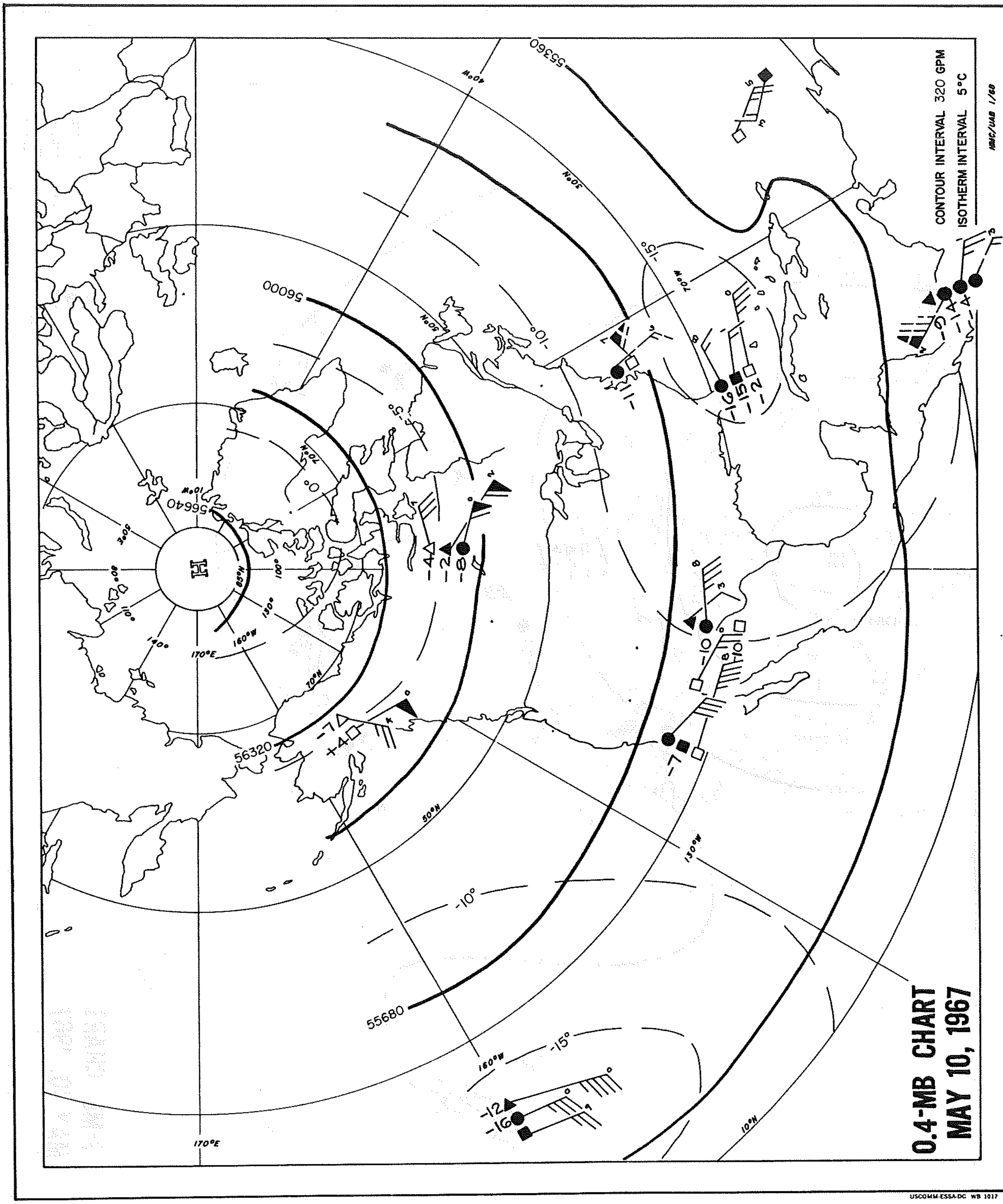
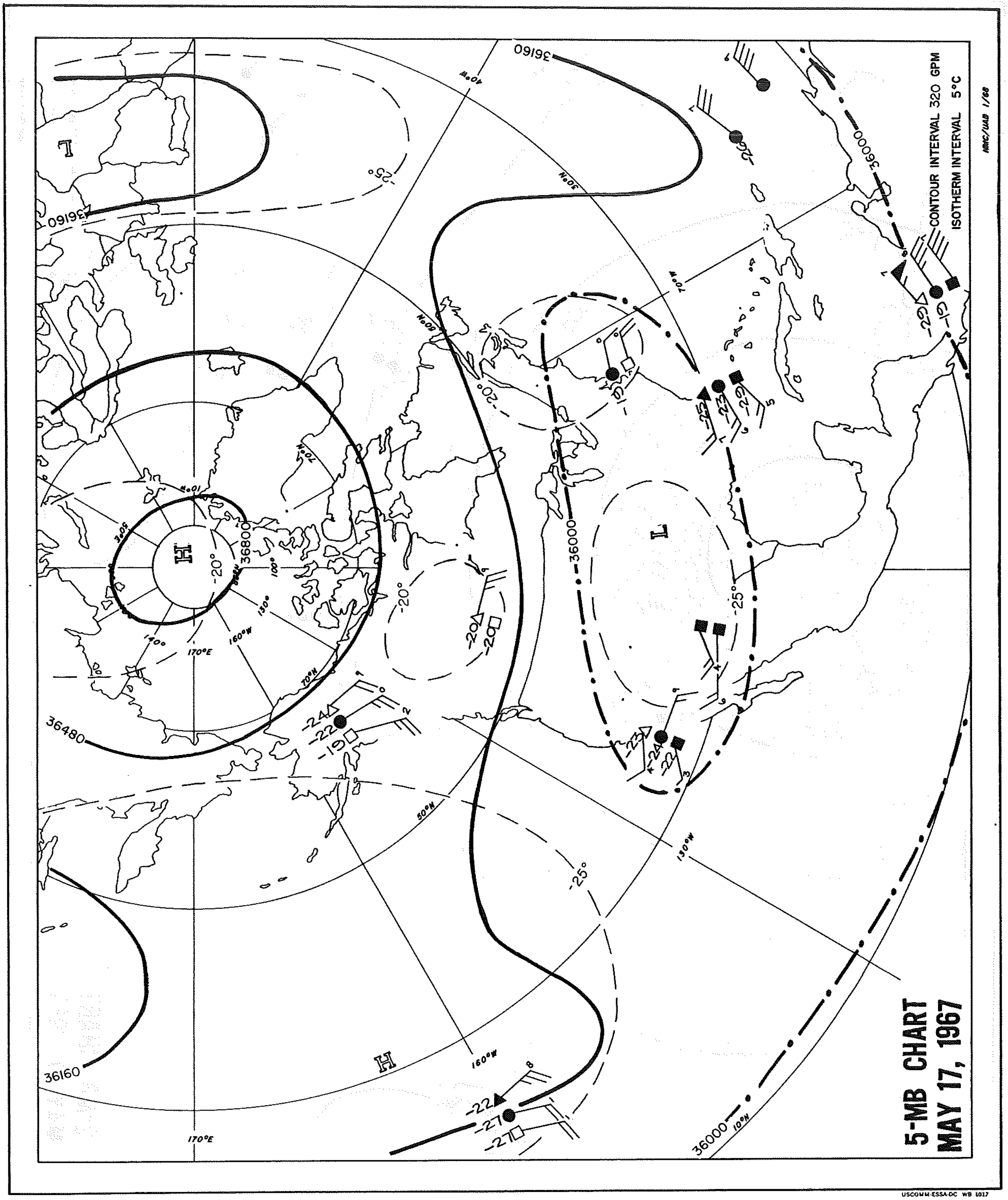


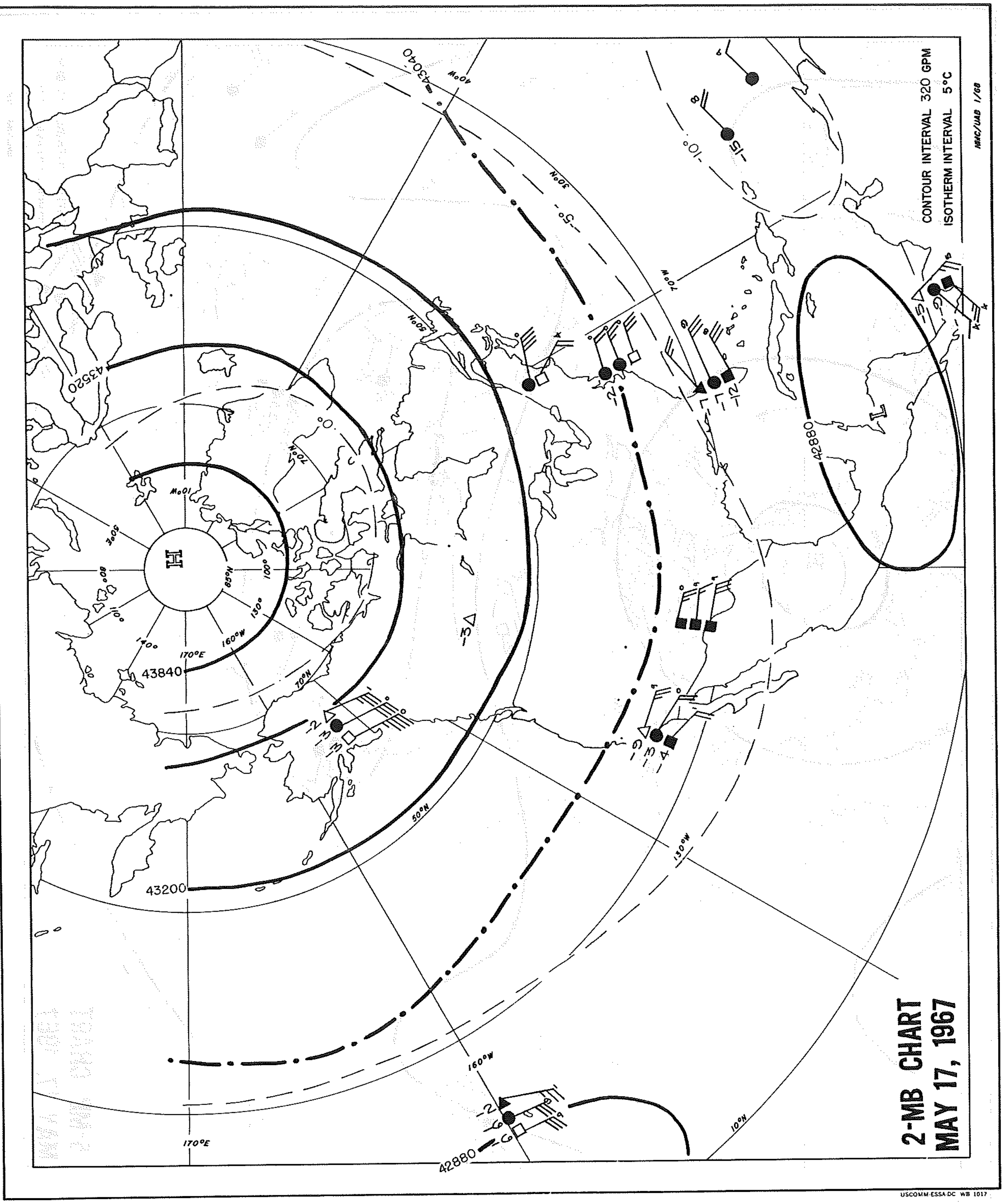
5-MB CHART
MAY 10, 1967
CONTOUR INTERVAL 320 GPM
ISOTHERM INTERVAL 5°C
USCOMM-ESSA-DC WB 1017

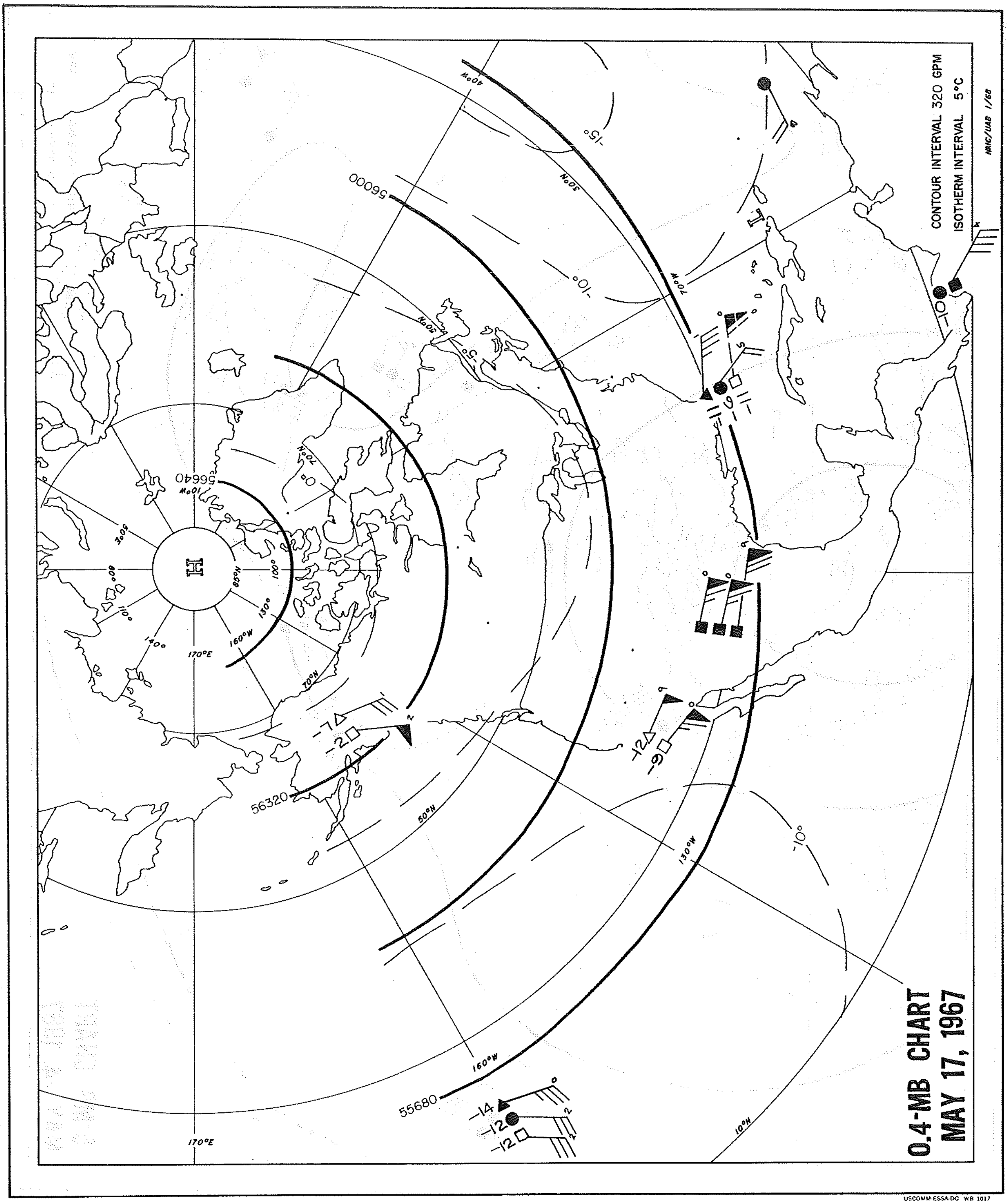

2-MB CHART
MAY 10, 1967
CONTOUR INTERVAL 320 GPM
ISOTHERM INTERVAL 5°C
NMC/UAB 1/68
43200
43840
43520
43040
H
L
-5°
-10°
0°
USCOMM ESSA-DC WB 1017

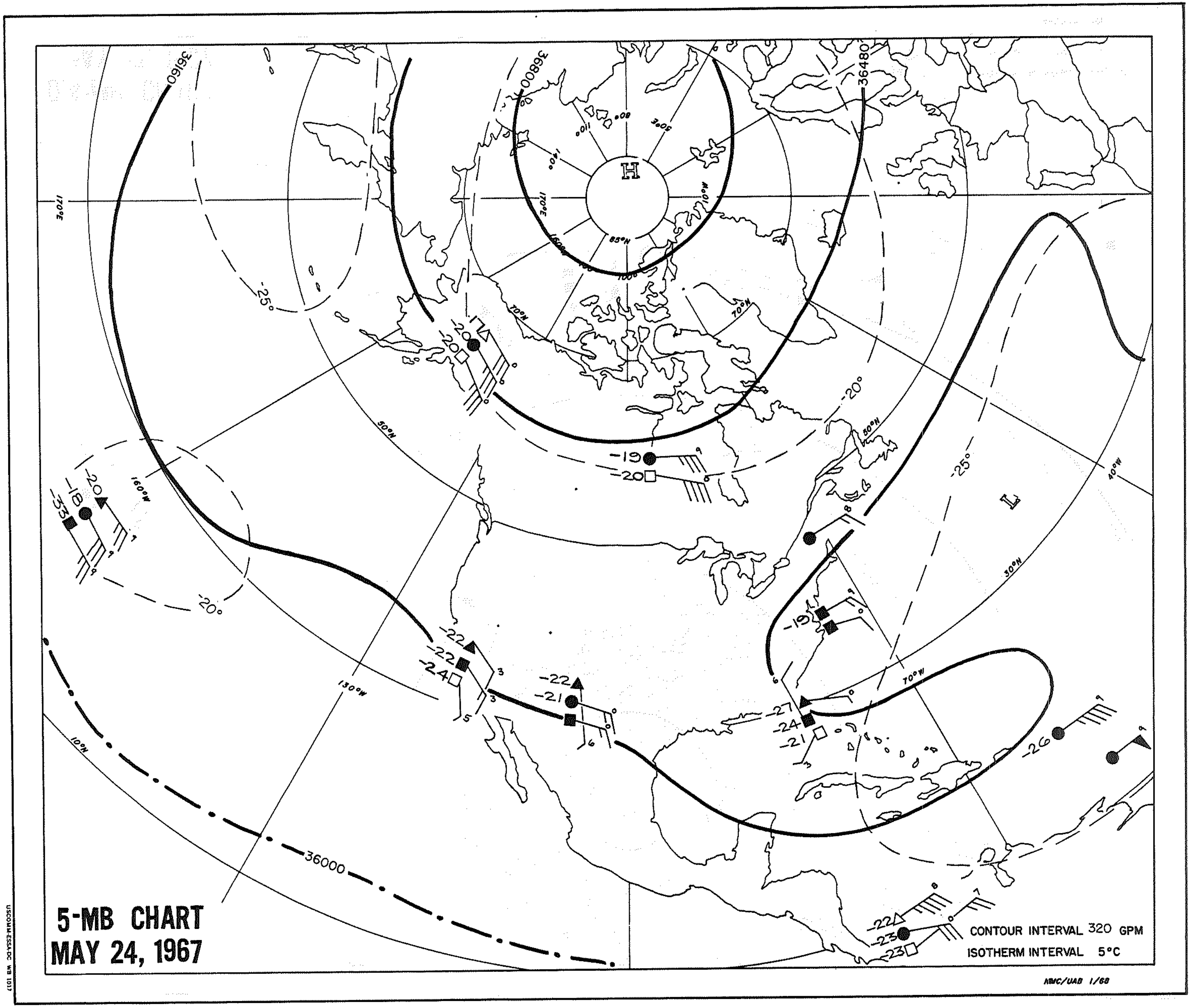

0.4-MB CHART
MAY 10, 1967
CONTOUR INTERVAL 320 GPM
ISOTHERM INTERVAL 5°C
55360
56000
56640
56320
55680
USCOMM-ESSA-DC WB 1017



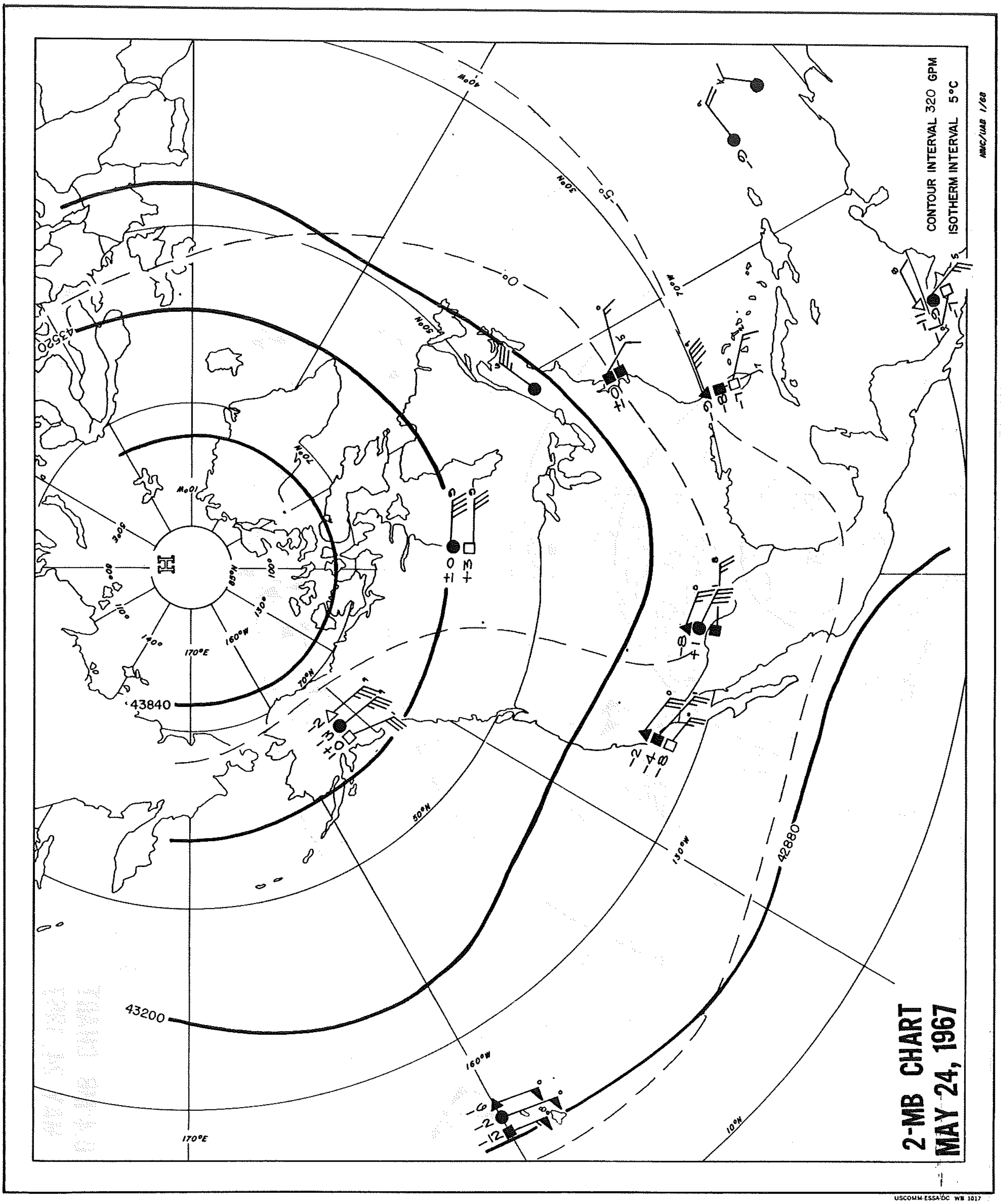
USCOMM-ESSA-DC WB 1017

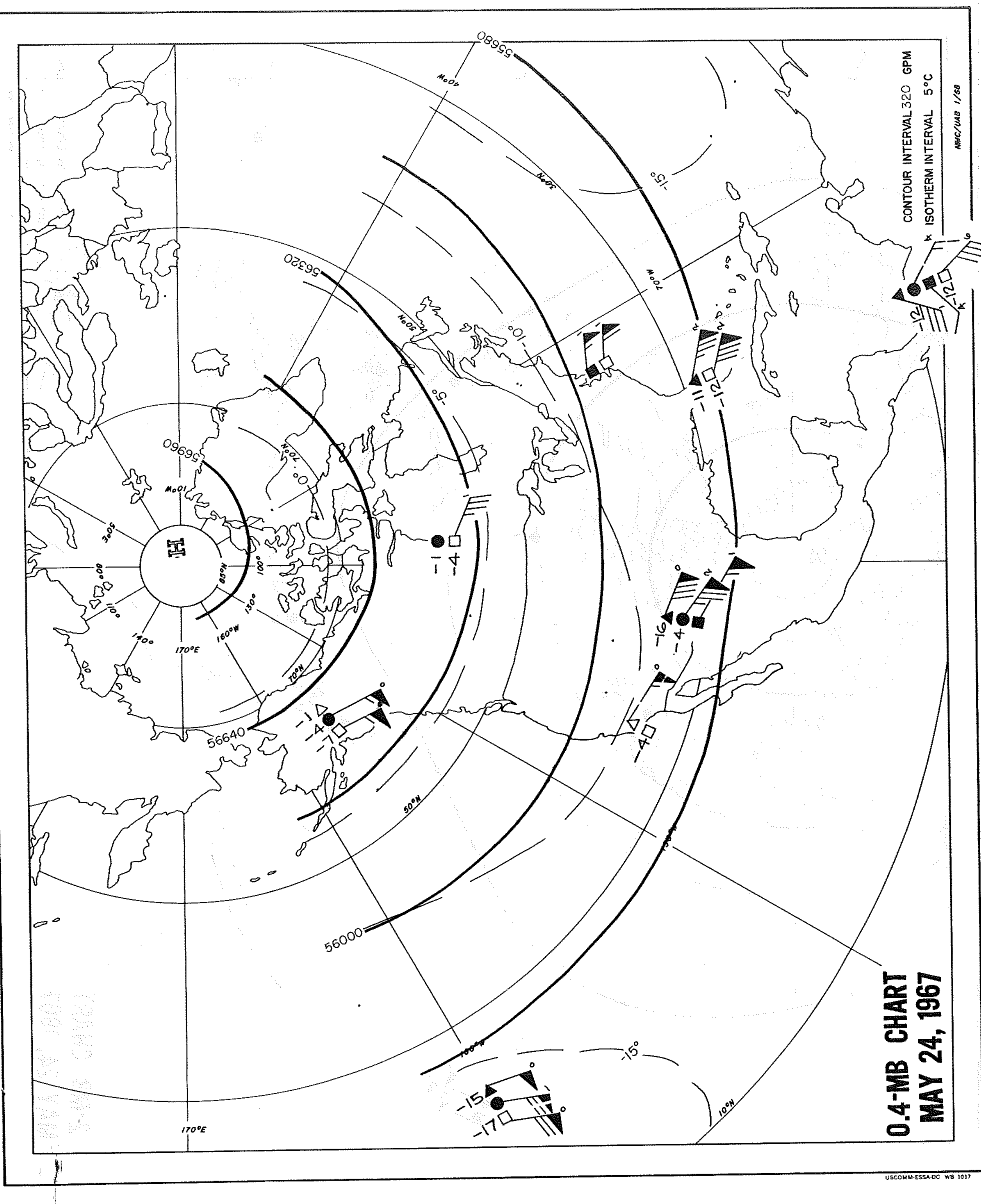

2-MB CHART
MAY 17, 1967
CONTOUR INTERVAL 320 GPM
ISOTHERM INTERVAL 5°C
43840
43520
43200
43040
42880
42880
USCOMM-ESSA-DC WB 1017

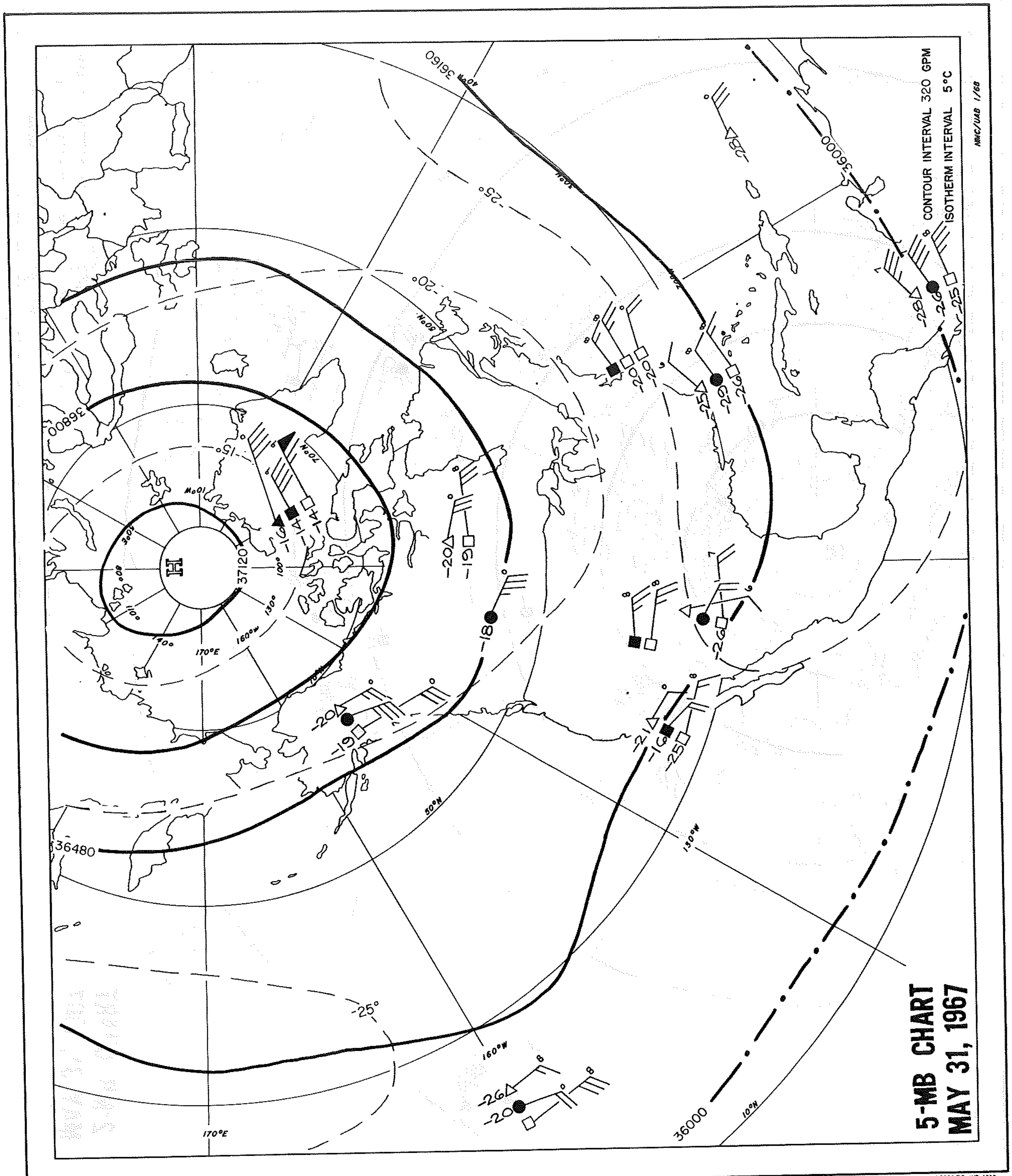

0.4-MB CHART
MAY 17, 1967
CONTOUR INTERVAL 320 GPM
ISOTHERM INTERVAL 5°C
NMC/UAB 1/68
56640
56320
56000
55680
H
L
-10°
-15°
USCOMM-ESSA-DC WB 1017

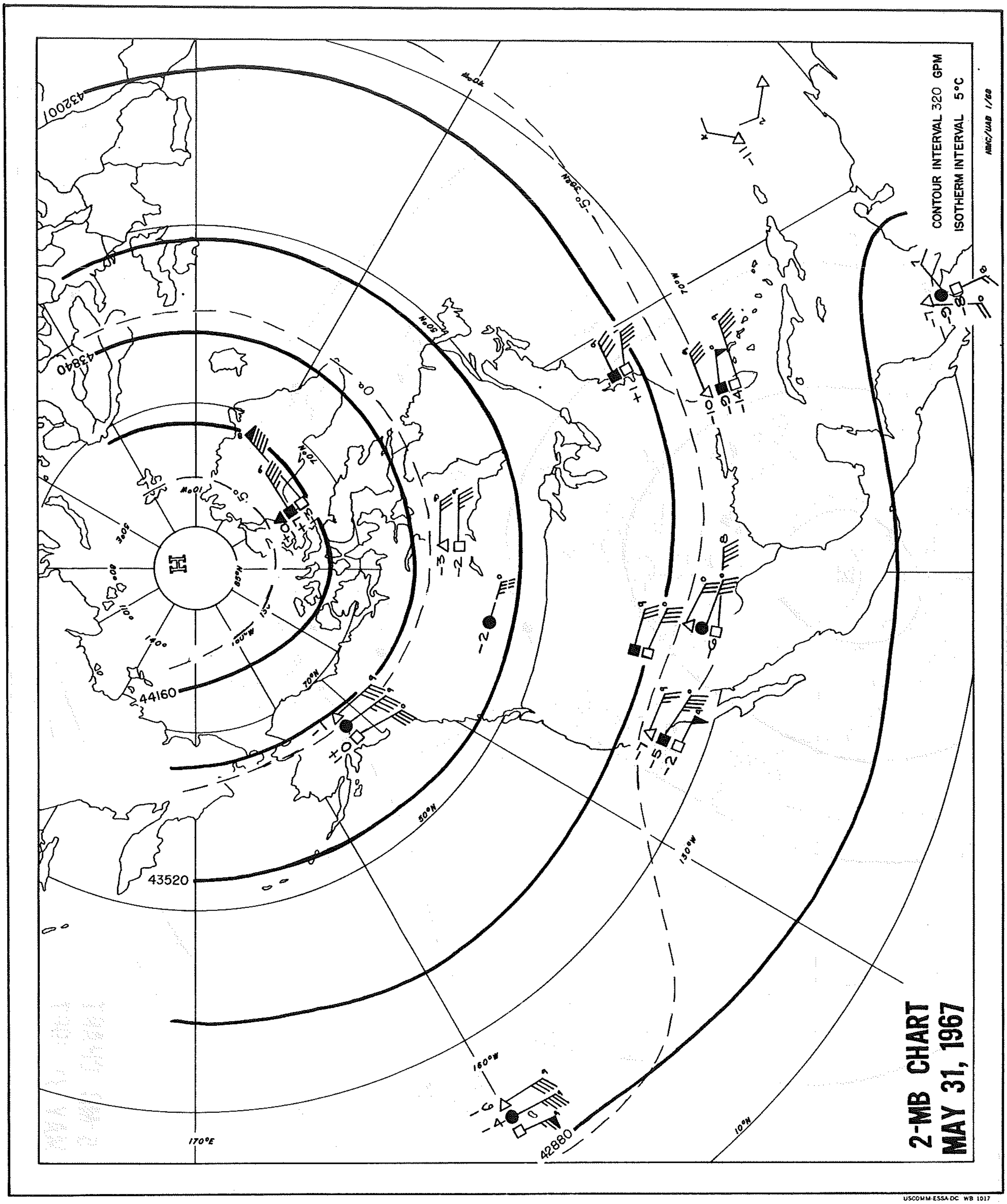


USCOMM-ESSA-DC WB 1017


2-MB CHART
MAY 24, 1967
CONTOUR INTERVAL 320 GPM
ISOTHERM INTERVAL 5°C
NMC/UAB 1/68
43840
43520
43200
42880
H
USCOMM-ESSA-DC WB 1017


0.4-MB CHART
MAY 24, 1967
CONTOUR INTERVAL 320 GPM
ISOTHERM INTERVAL 5°C
NMC/UAB 1/68
55680
56320
56960
56640
56000
H
USCOMM-ESSA DC WB 1017


5-MB CHART
MAY 31, 1967
CONTOUR INTERVAL 320 GPM
ISOTHERM INTERVAL 5°C
NMC/UAB 1/68
36160
36000
36800
36480
37120
36000
USCOMM-ESSA-DC WB 1017



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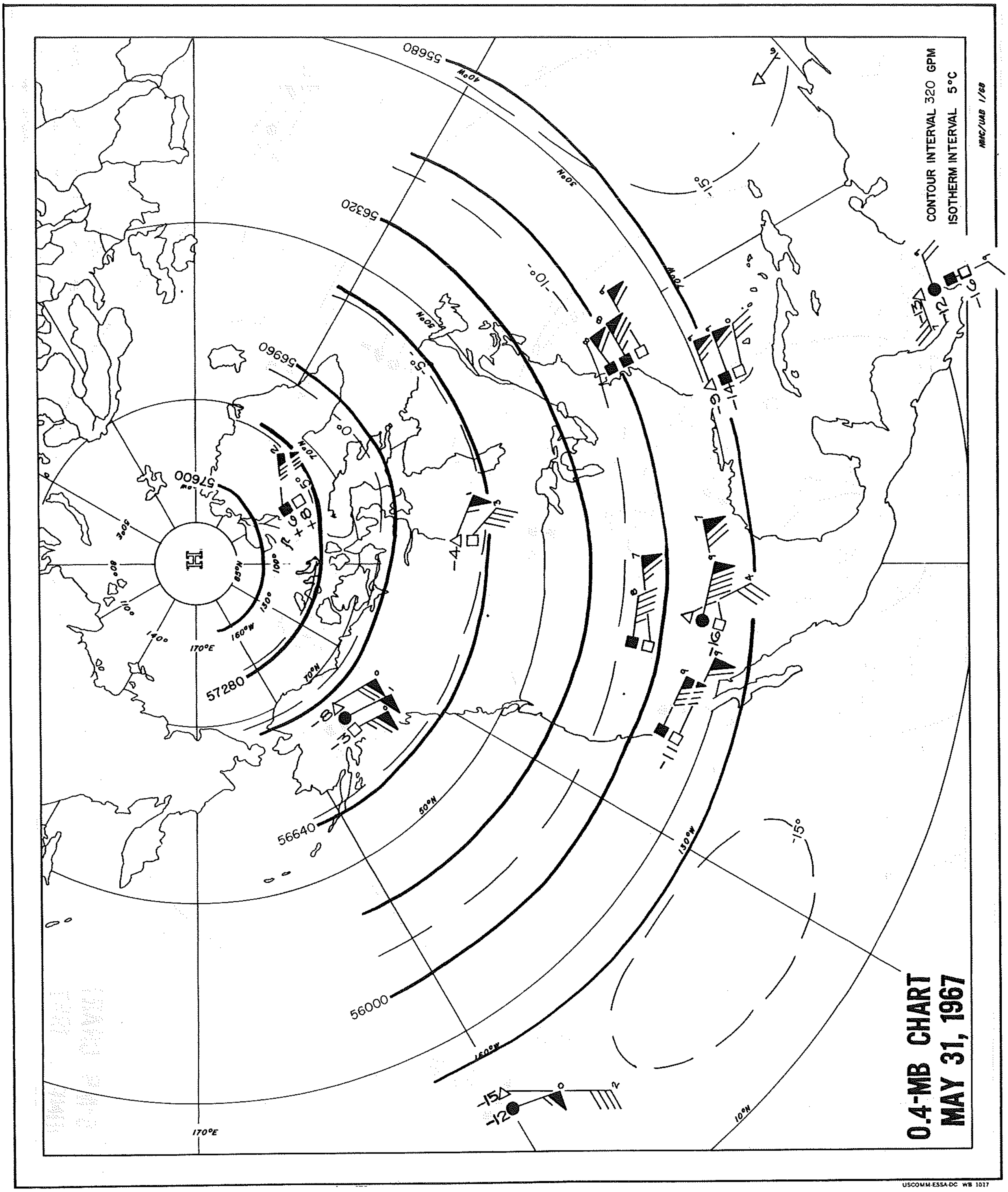

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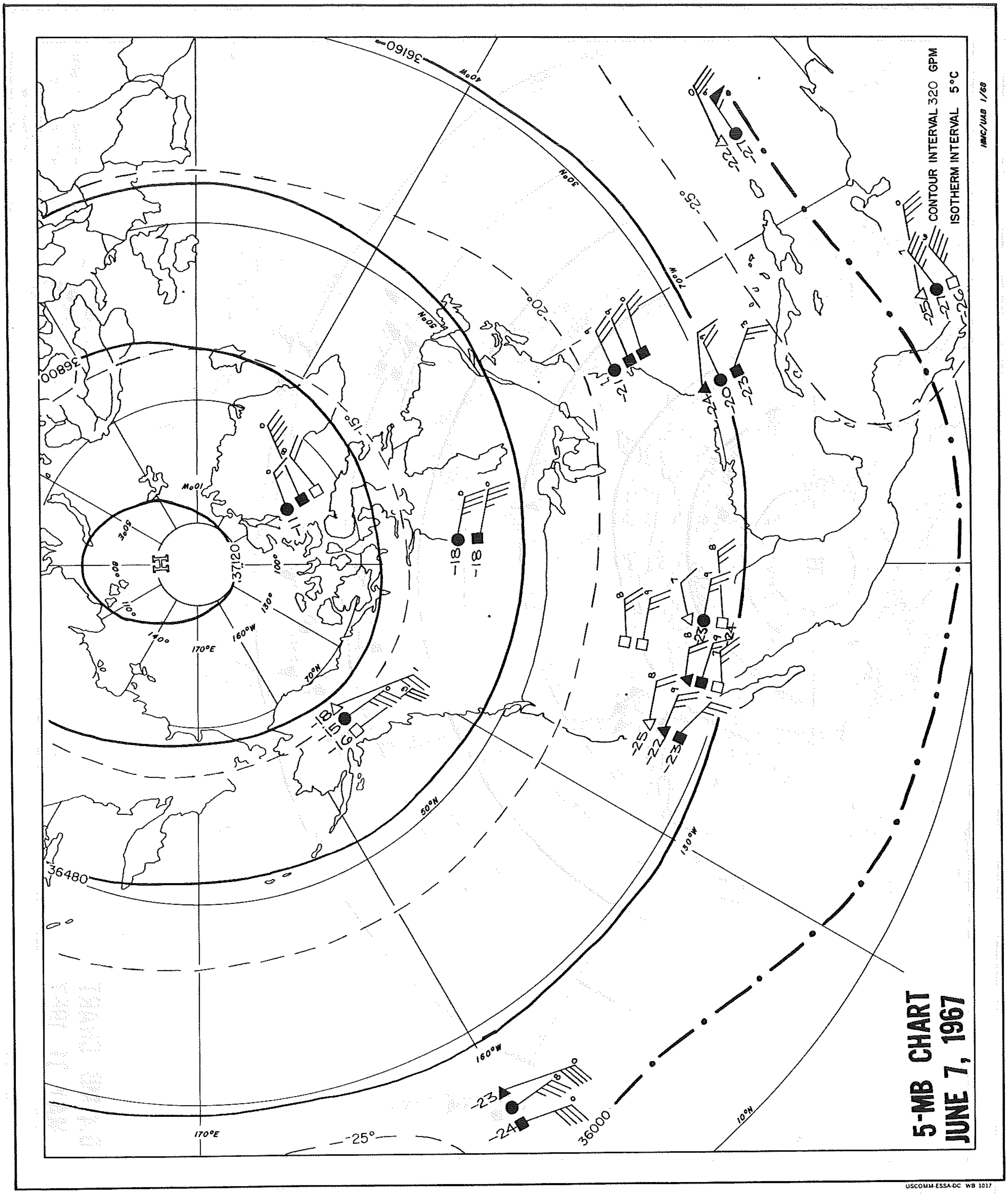
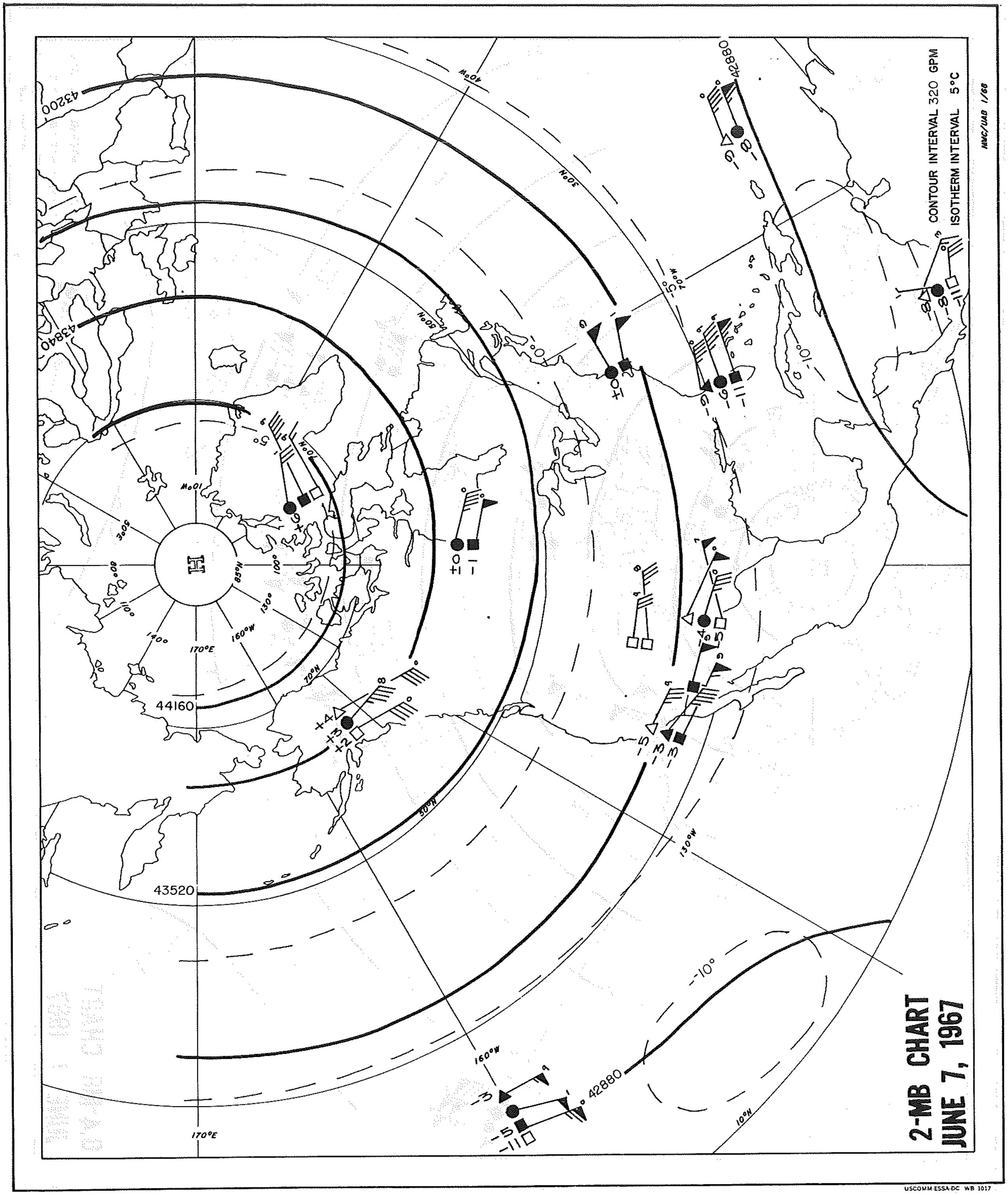
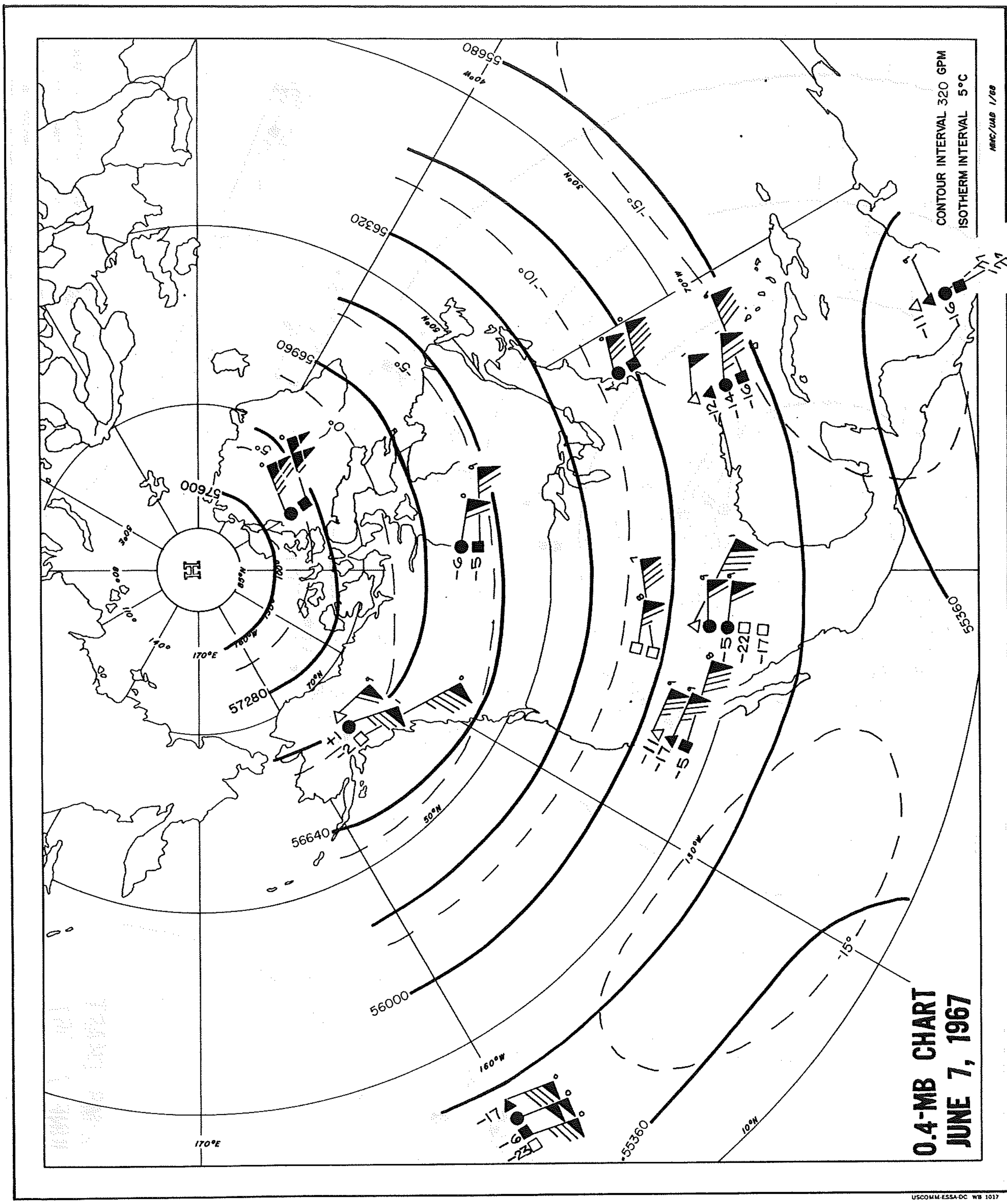
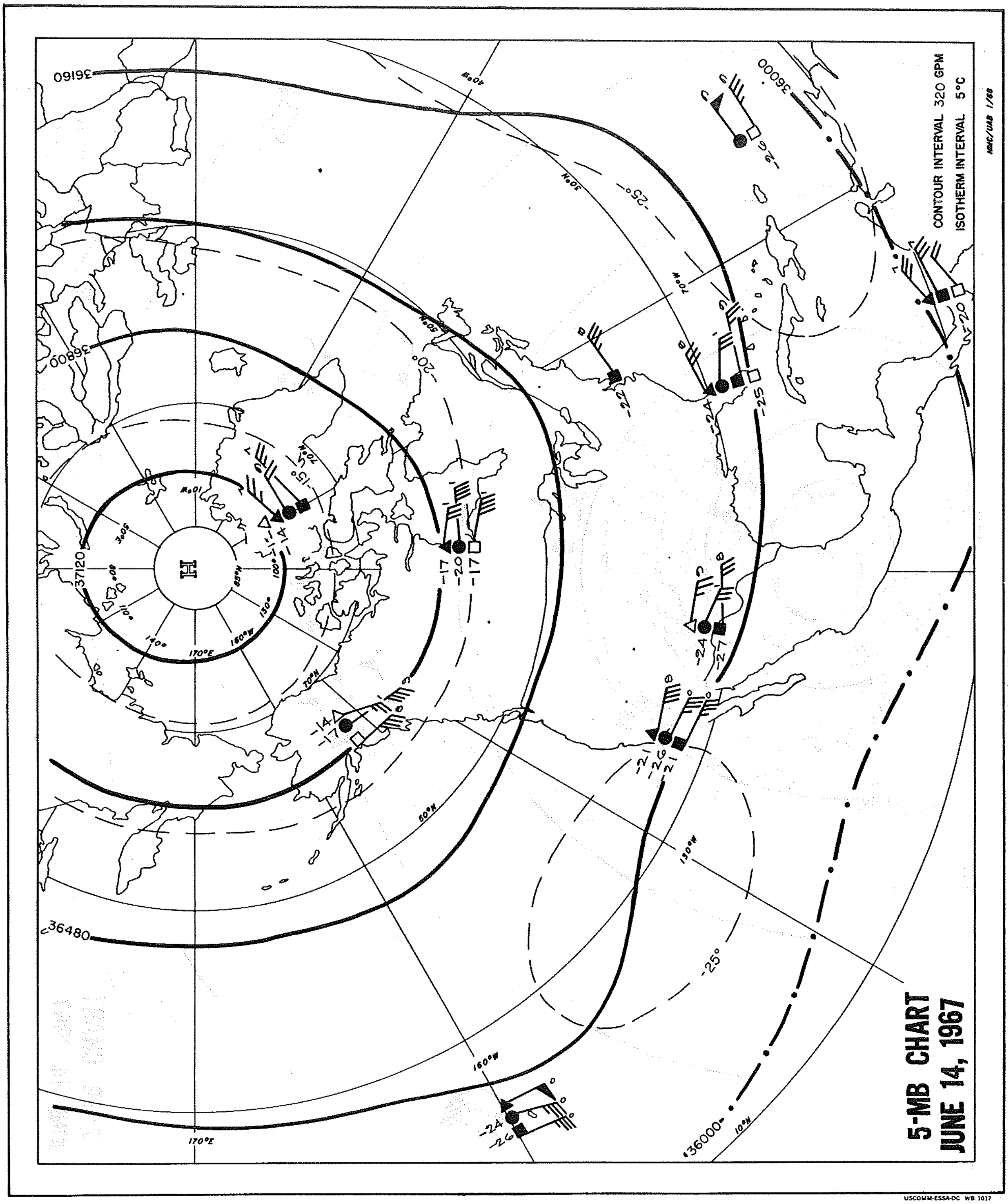

5-MB CHART
JUNE 7, 1967
CONTOUR INTERVAL 320 GPM
ISOTHERM INTERVAL 5°C
36160
36800
37120
36480
36000
USCOMM-ESSA-DC WB 1017



USCOMM-ESSA-DC WB 1017


0.4-MB CHART
JUNE 7, 1967
CONTOUR INTERVAL 320 GPM
ISOTHERM INTERVAL 5°C
NMC/UAB 1/68
USCOMM-ESSA-DC WB 1017
57600
57280
56960
56640
56320
56000
55680
55360
H



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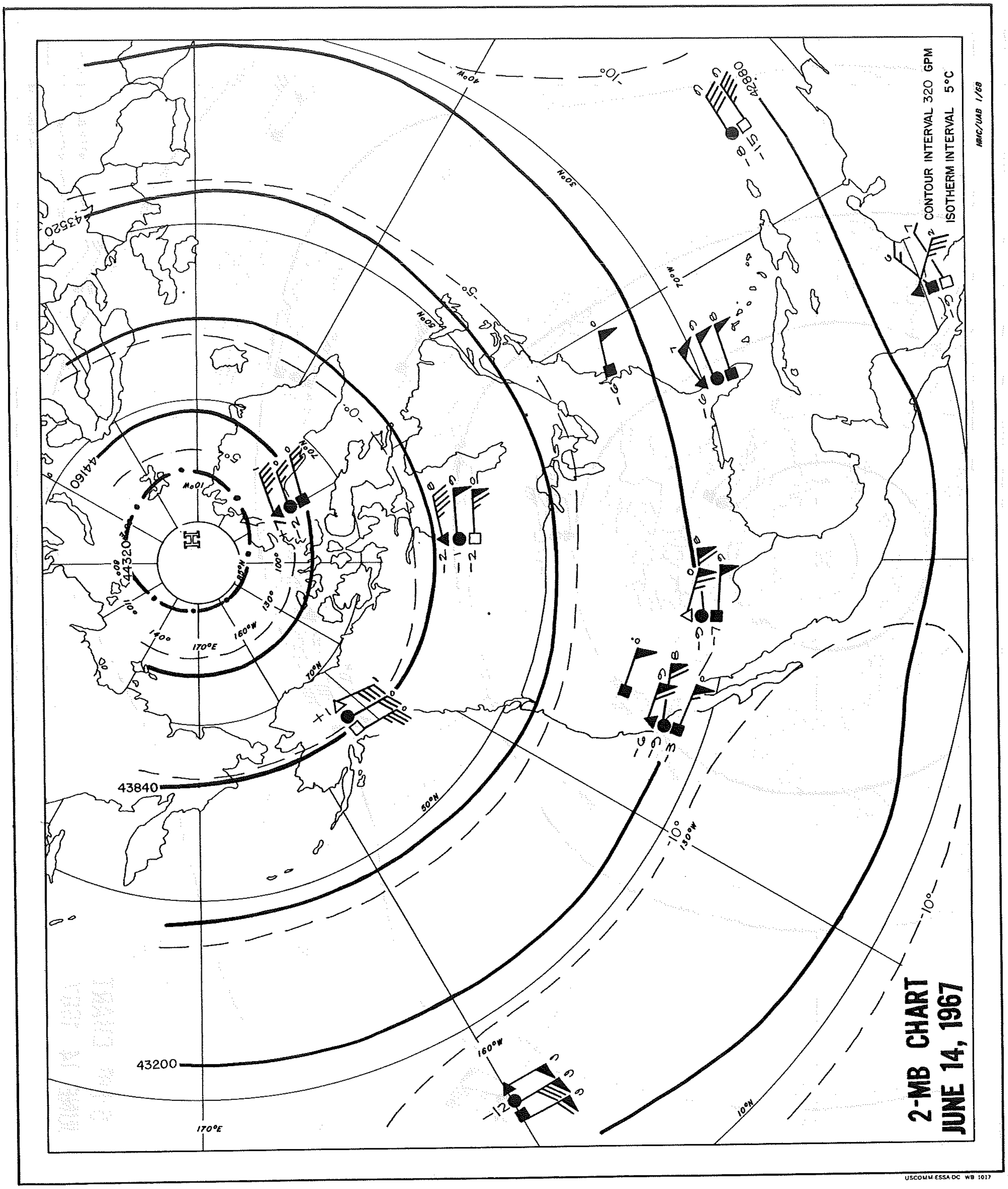
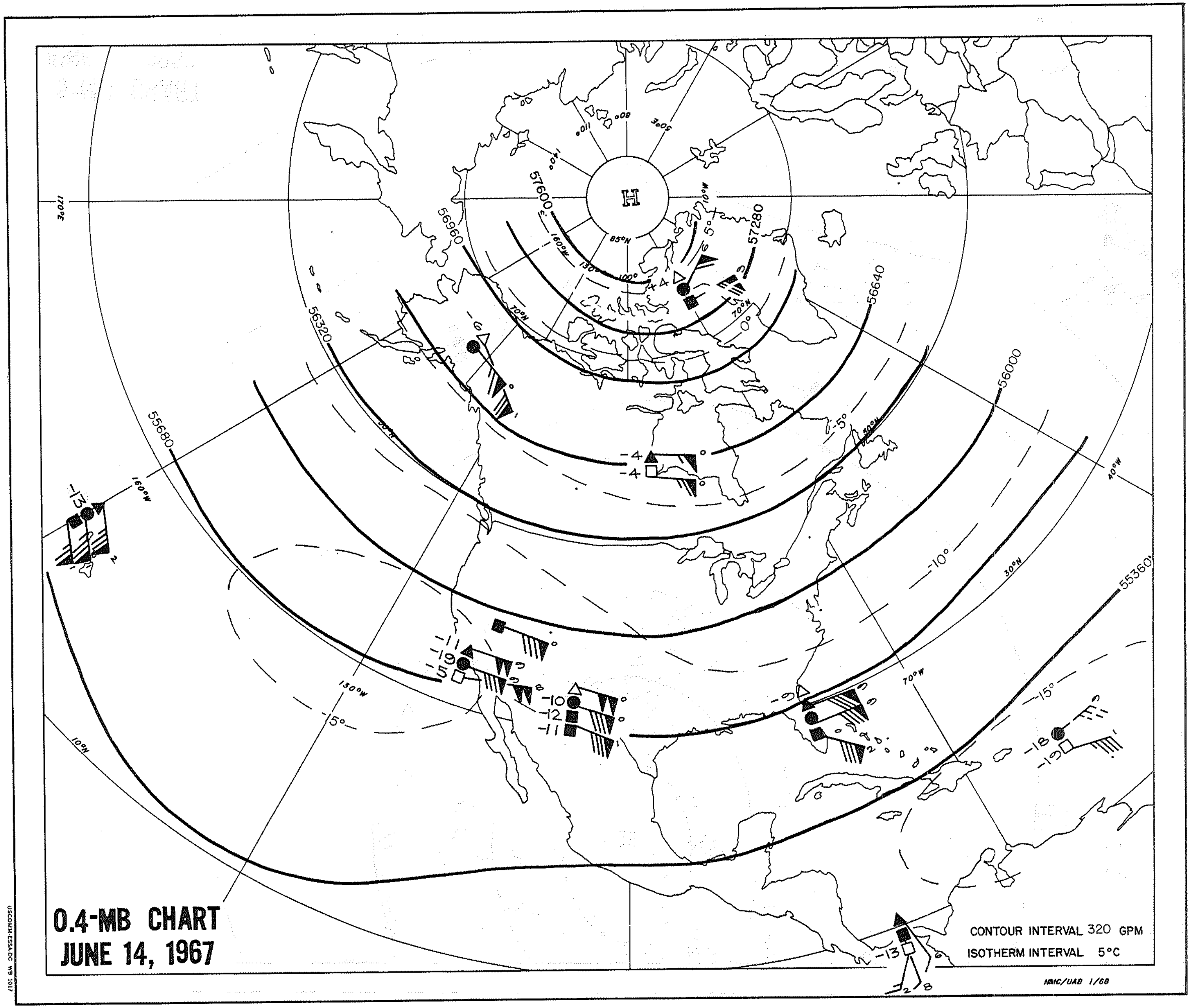
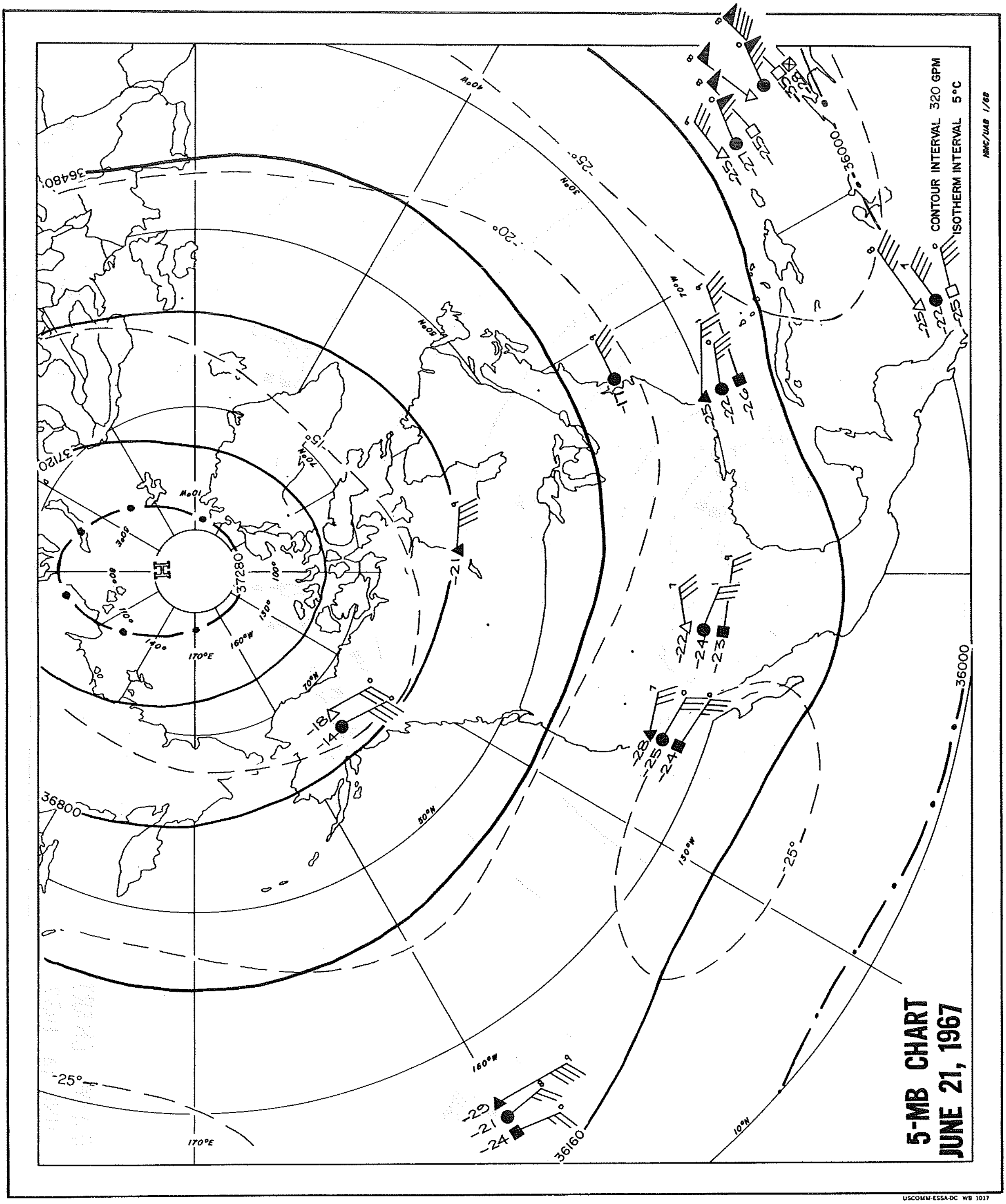
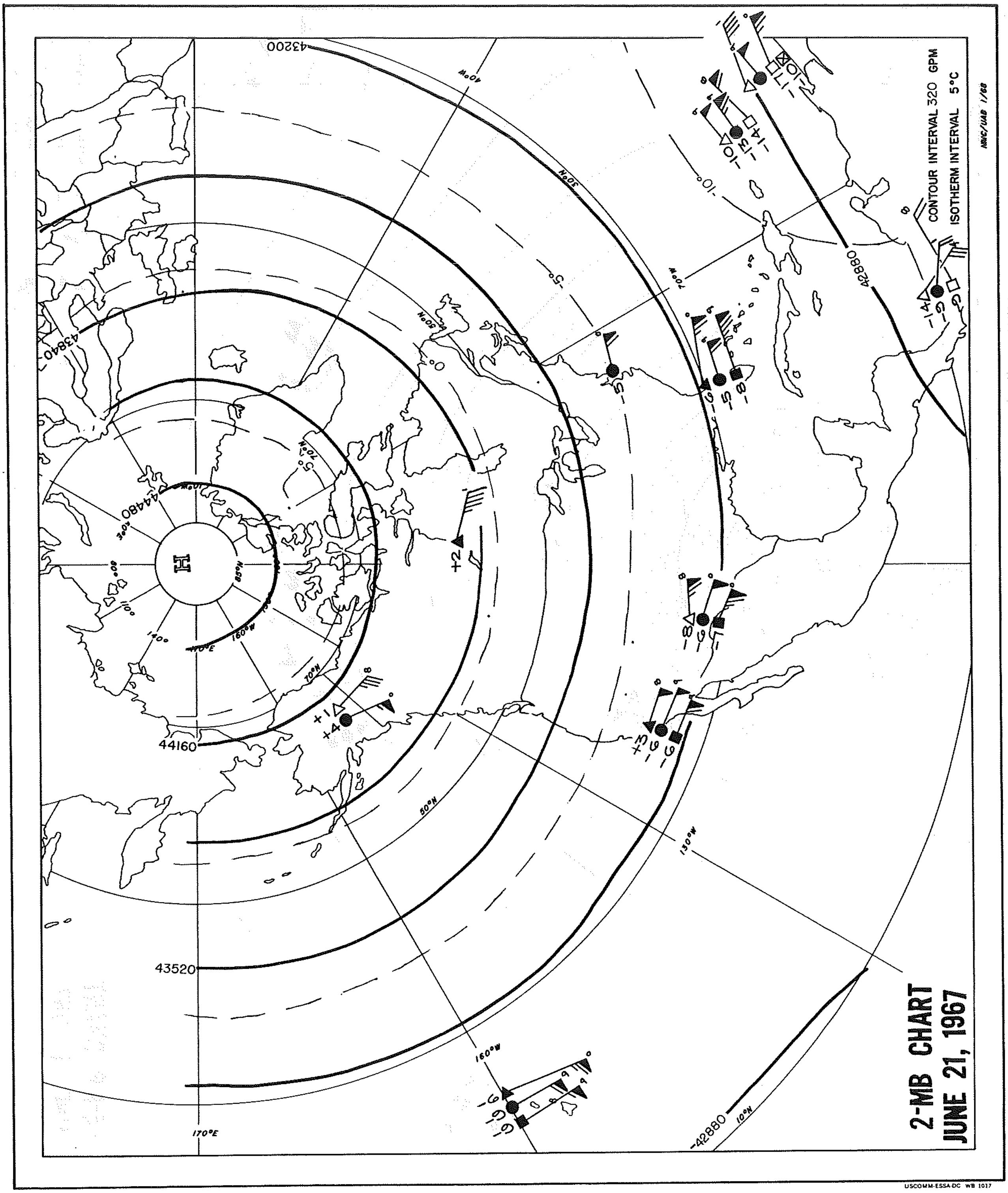
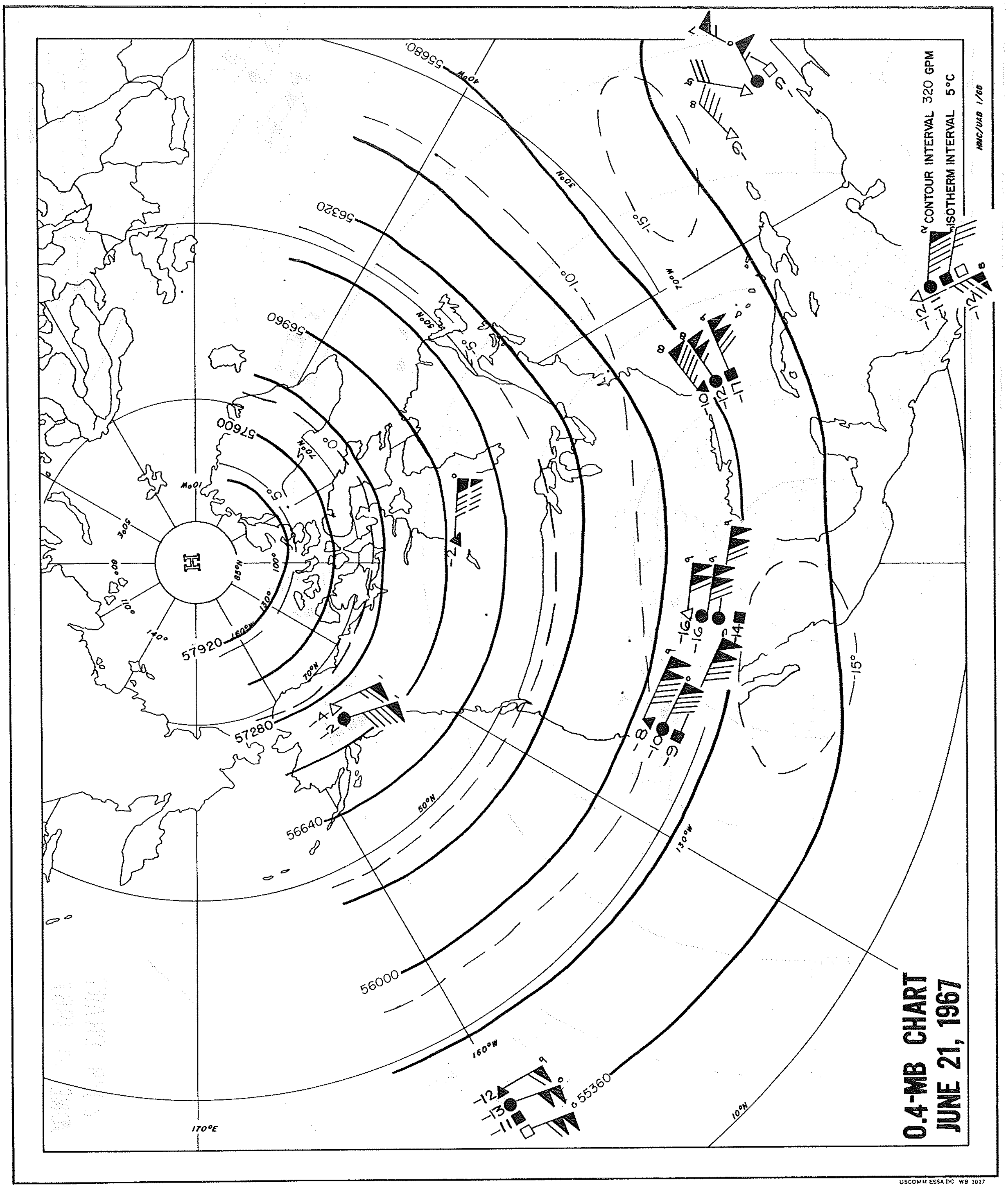

2-MB CHART
JUNE 14, 1967
CONTOUR INTERVAL 320 GPM
ISOTHERM INTERVAL 5°C
43200
43520
43840
44160
44320
42880
USCOMM-ESSA-DC WB 1017



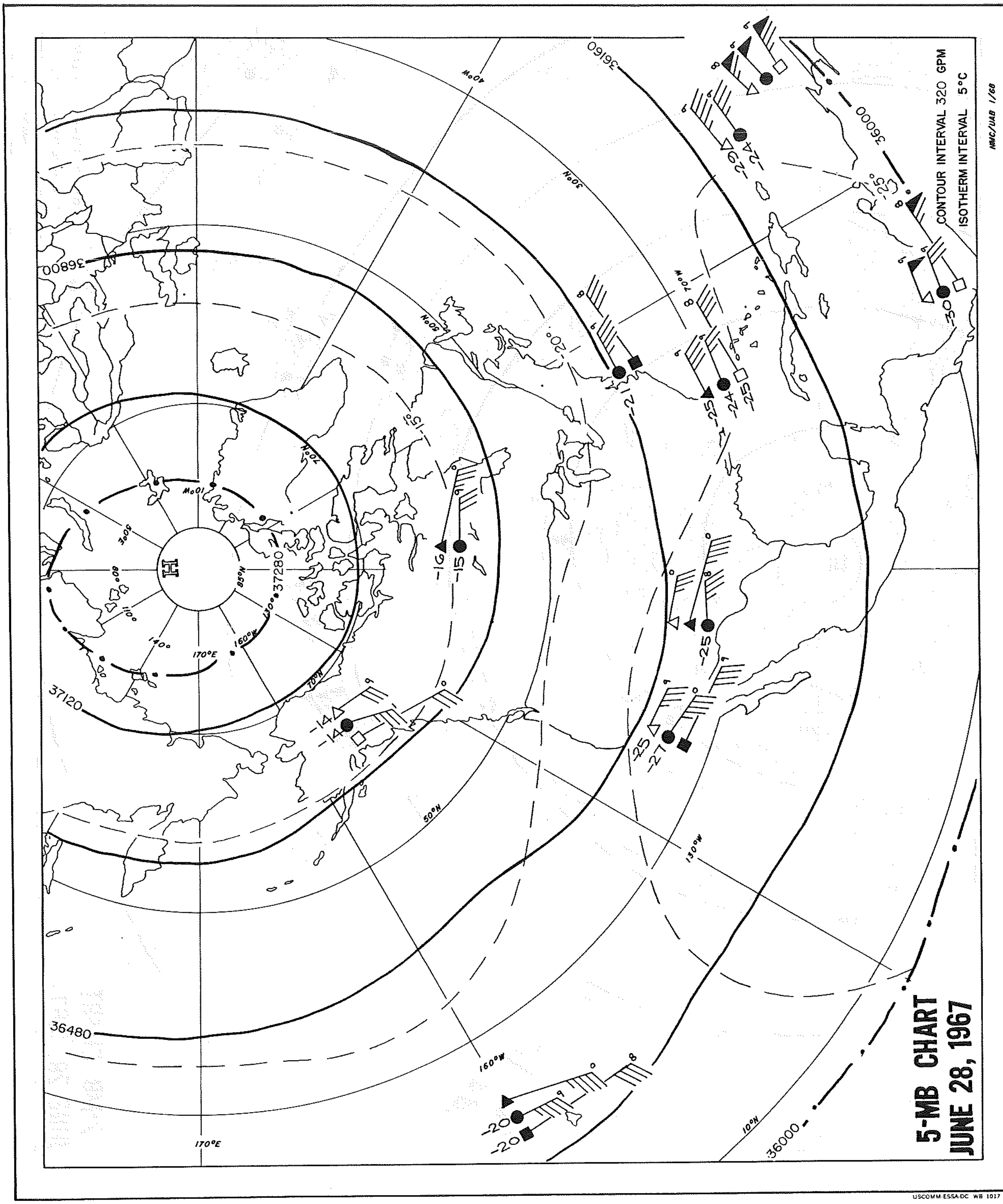
0.4-MB CHART
JUNE 14, 1967


5-MB CHART
JUNE 21, 1967
CONTOUR INTERVAL 320 GPM
ISOTHERM INTERVAL 5°C
USCOMM-ESSA-DC WB 1017


2-MB CHART
JUNE 21, 1967
CONTOUR INTERVAL 320 GPM
ISOTHERM INTERVAL 5°C
43200
43840
44480
44160
43520
42880
-42880
H
USCOMM-ESSA-DC WB 1017



0.4-MB CHART
JUNE 21, 1967
CONTOUR INTERVAL 320 GPM
ISOTHERM INTERVAL 5°C
NMC/UAB 1/68
57920
57600
57280
56960
56640
56320
56000
55680
55360
-5°
-10°
-15°
H
USCOMM-ESSA-DC WB 1017



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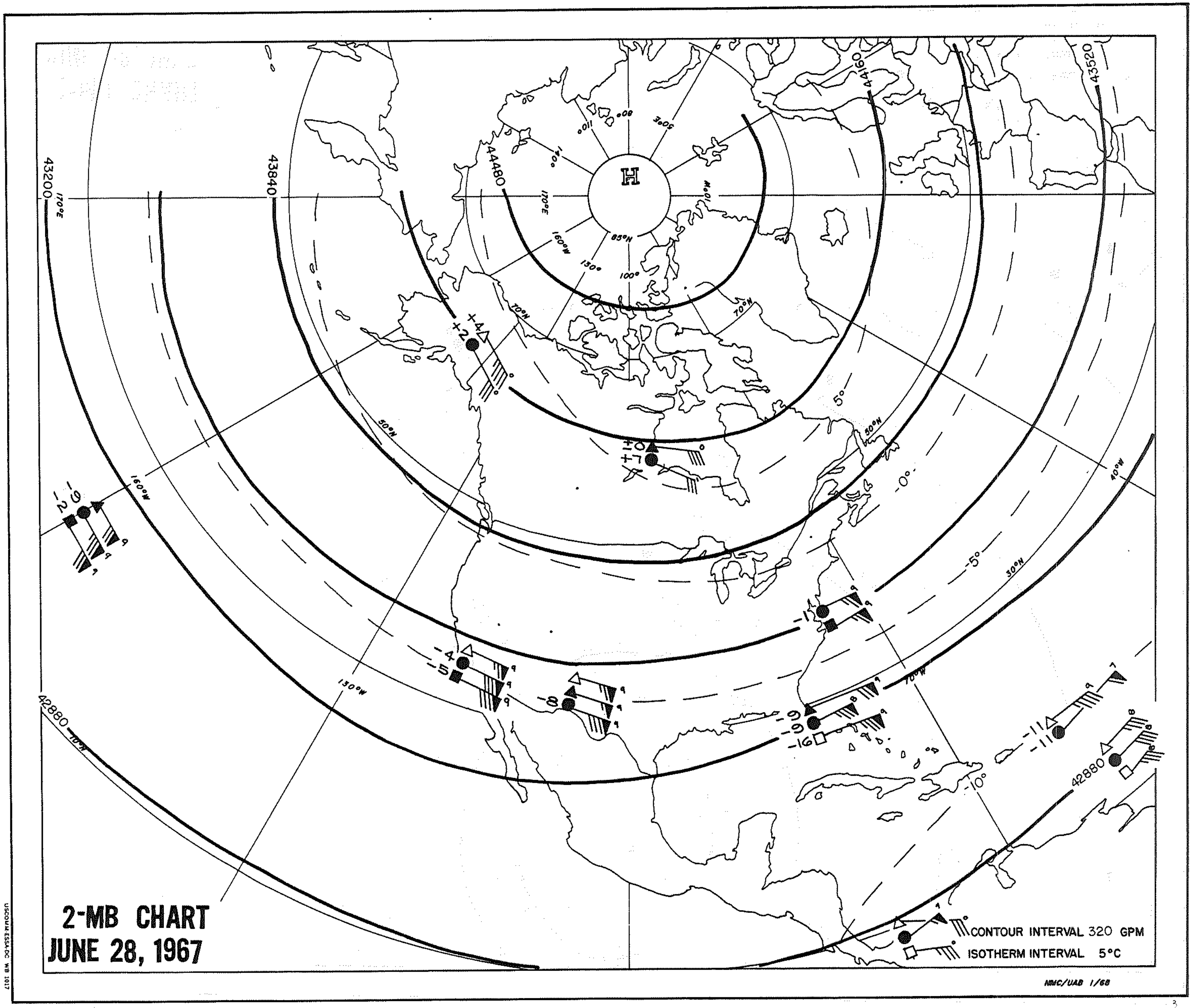
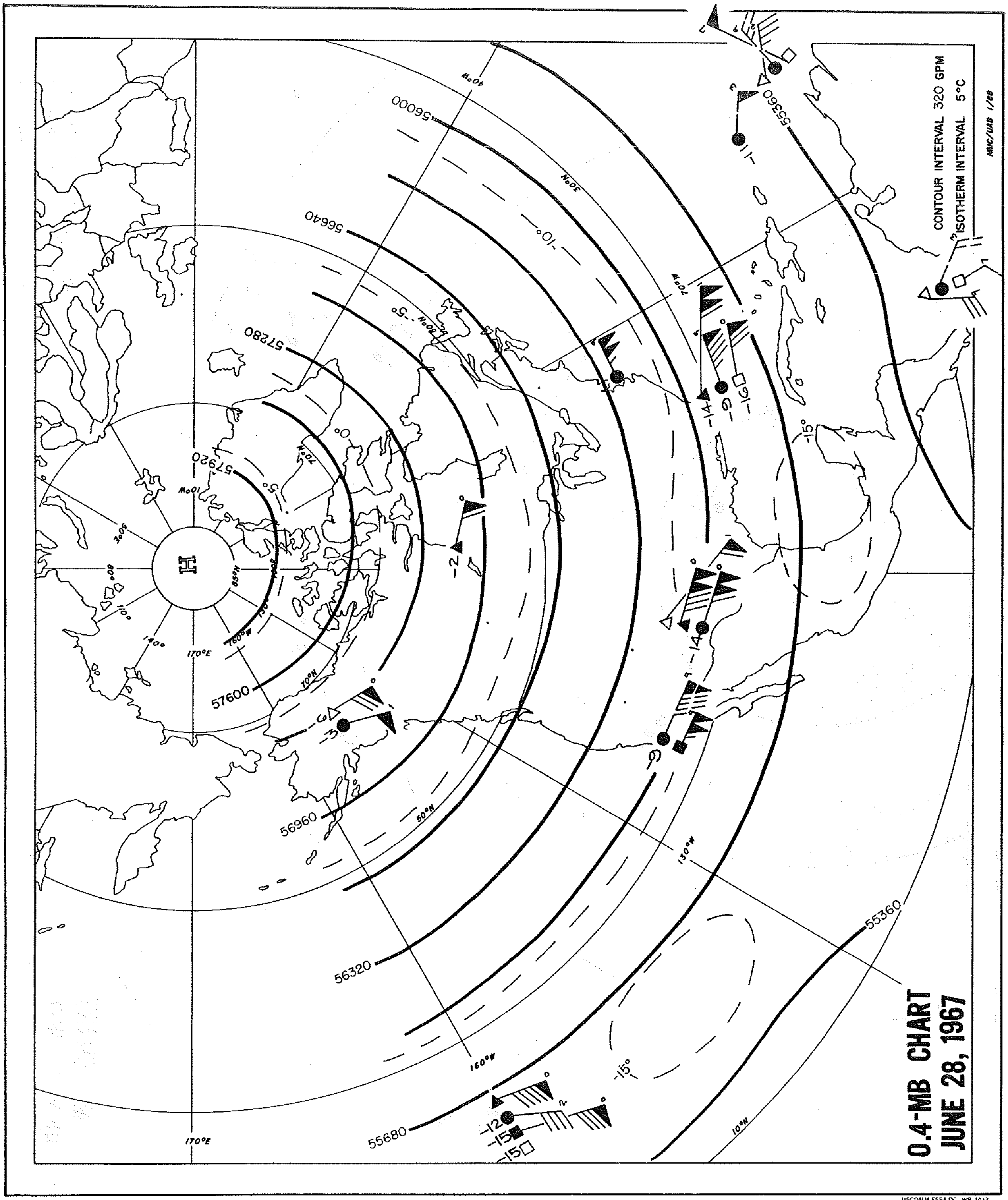
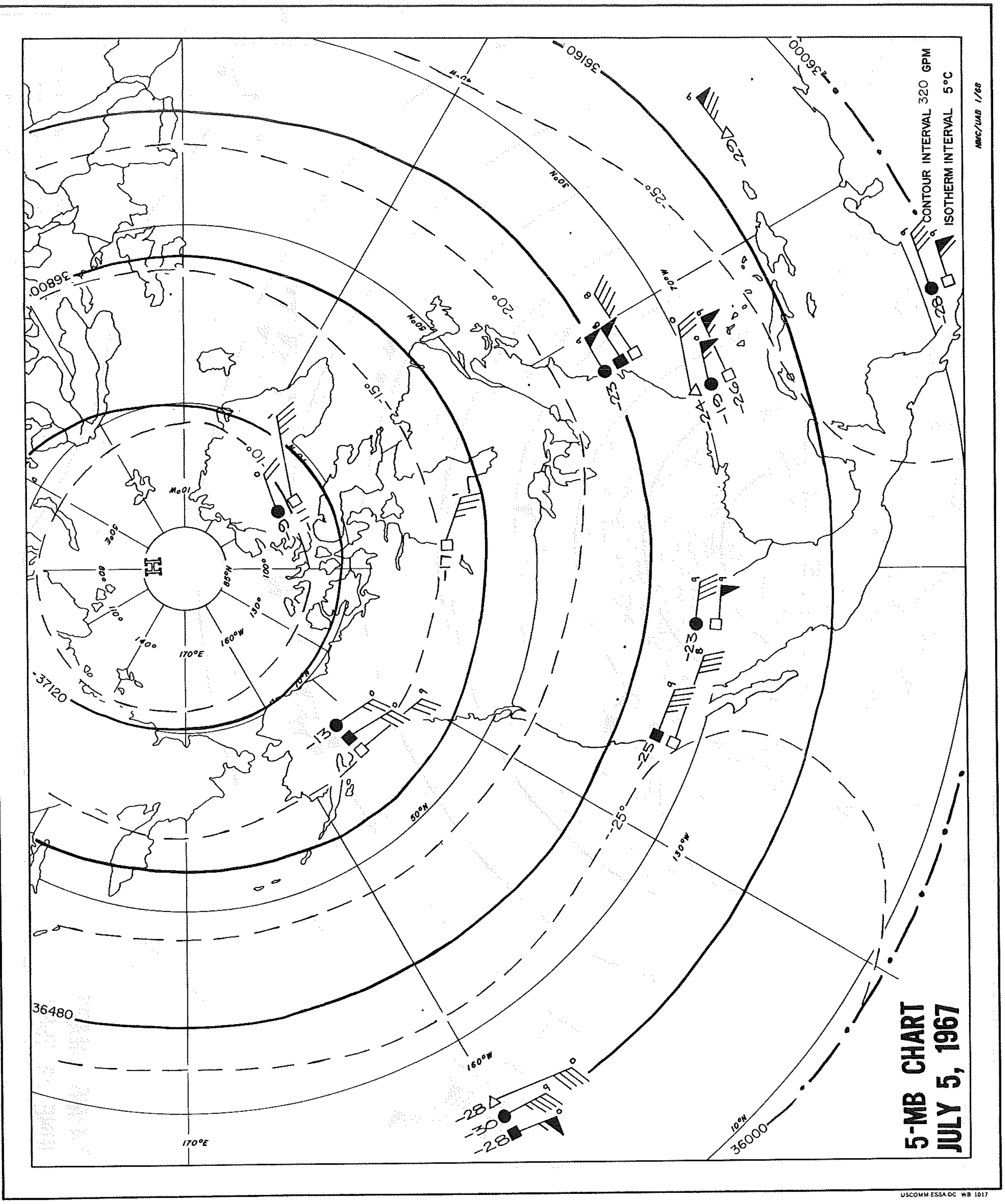

2-MB CHART
JUNE 28, 1967
CONTOUR INTERVAL 320 GPM
ISOTHERM INTERVAL 5°C
NMC/UAB 1/68
USCOMM-ESSA-DC WB 1017
H
43200
43840
44480
44160
43520
42880


0.4-MB CHART
JUNE 28, 1967
CONTOUR INTERVAL 320 GPM
ISOTHERM INTERVAL 5°C
NMC/UAB 1/68
56000
56640
57280
57920
57600
56960
56320
55680
55360
H
USCOMM-ESSA-DC WB 1017



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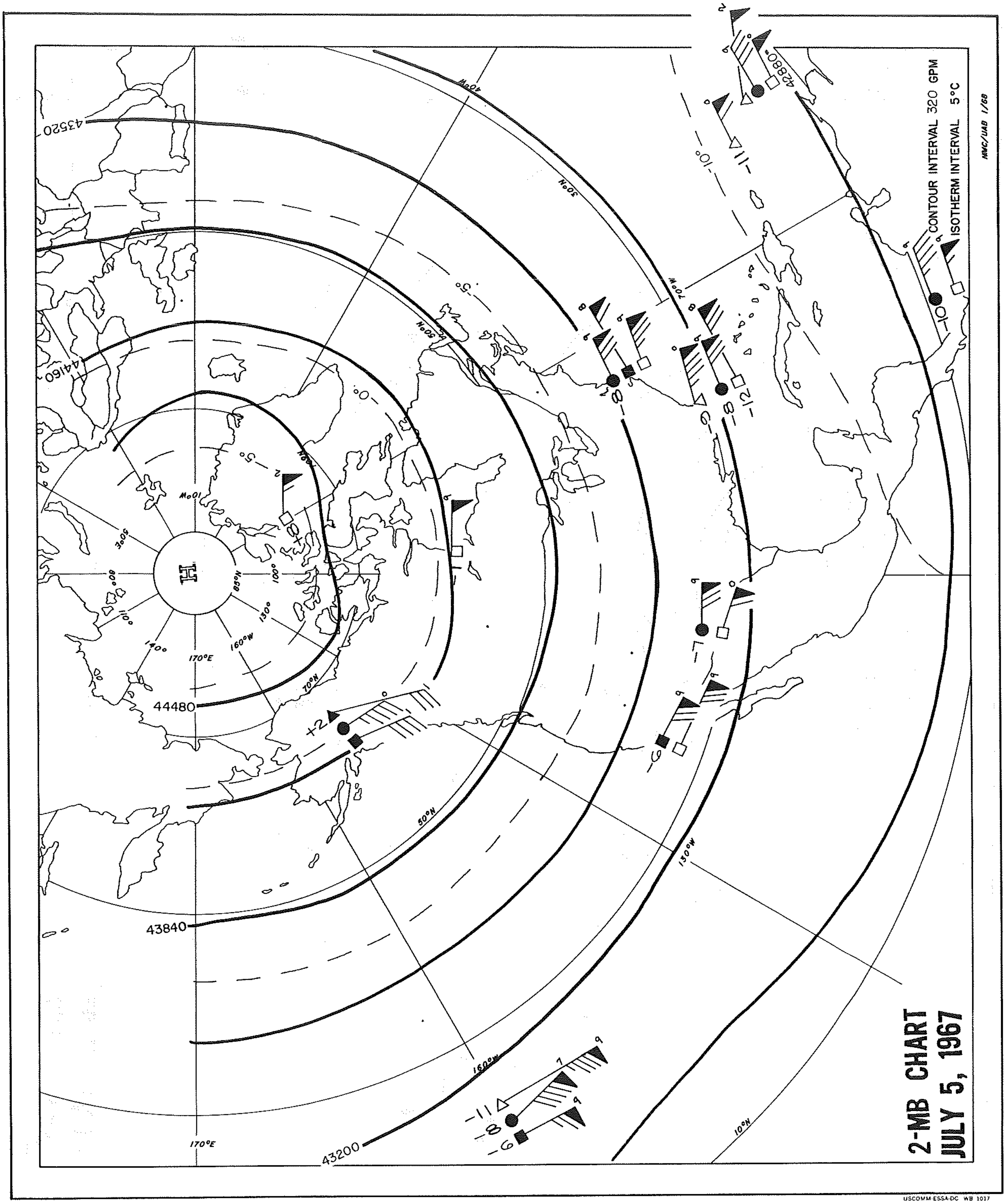
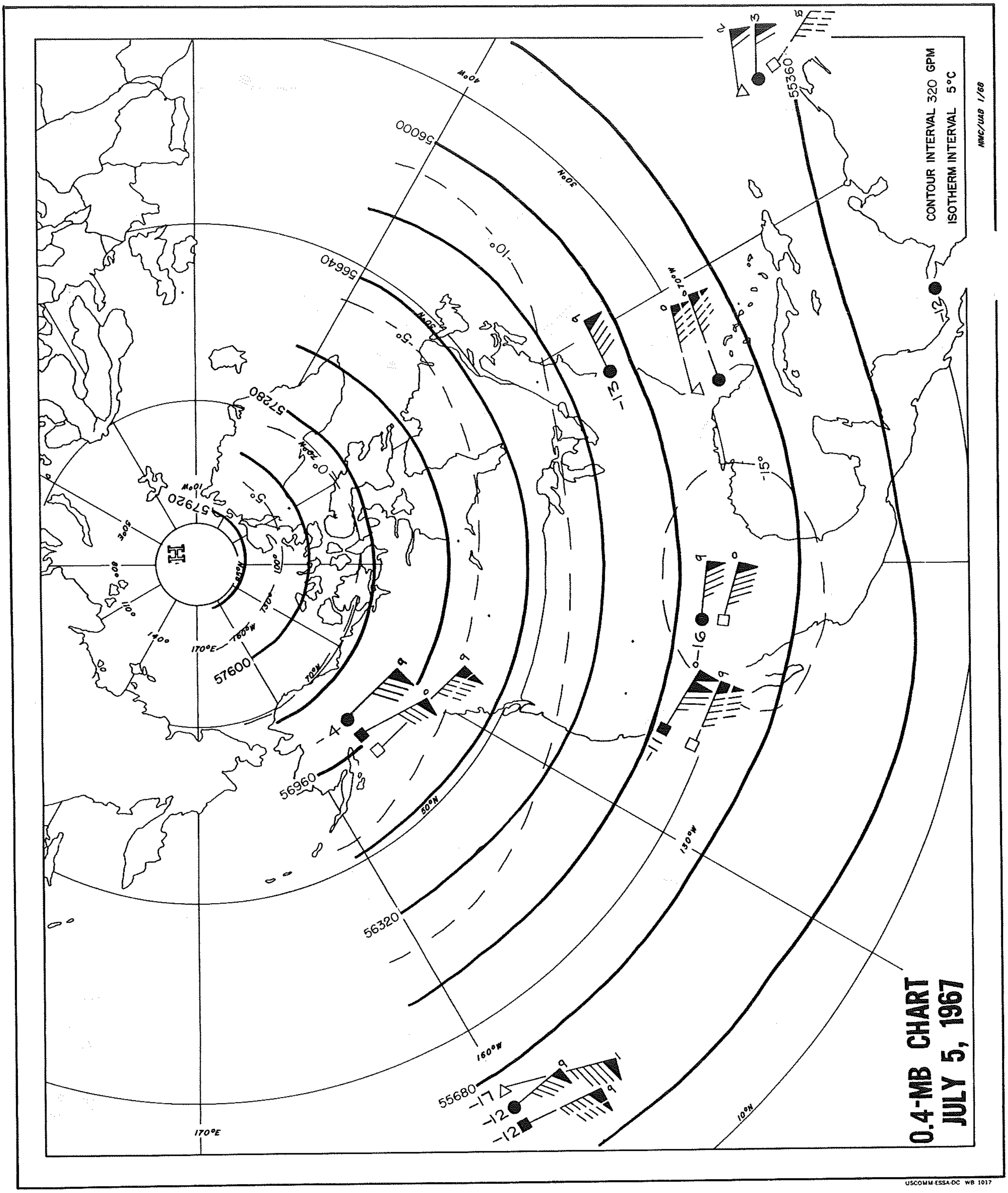

2-MB CHART
JULY 5, 1967
CONTOUR INTERVAL 320 GPM
ISOTHERM INTERVAL 5°C
NMC/UAB 1/68
43520
44160
44480
43840
43200
42880
USCOMM-ESSA-DC WB 1017



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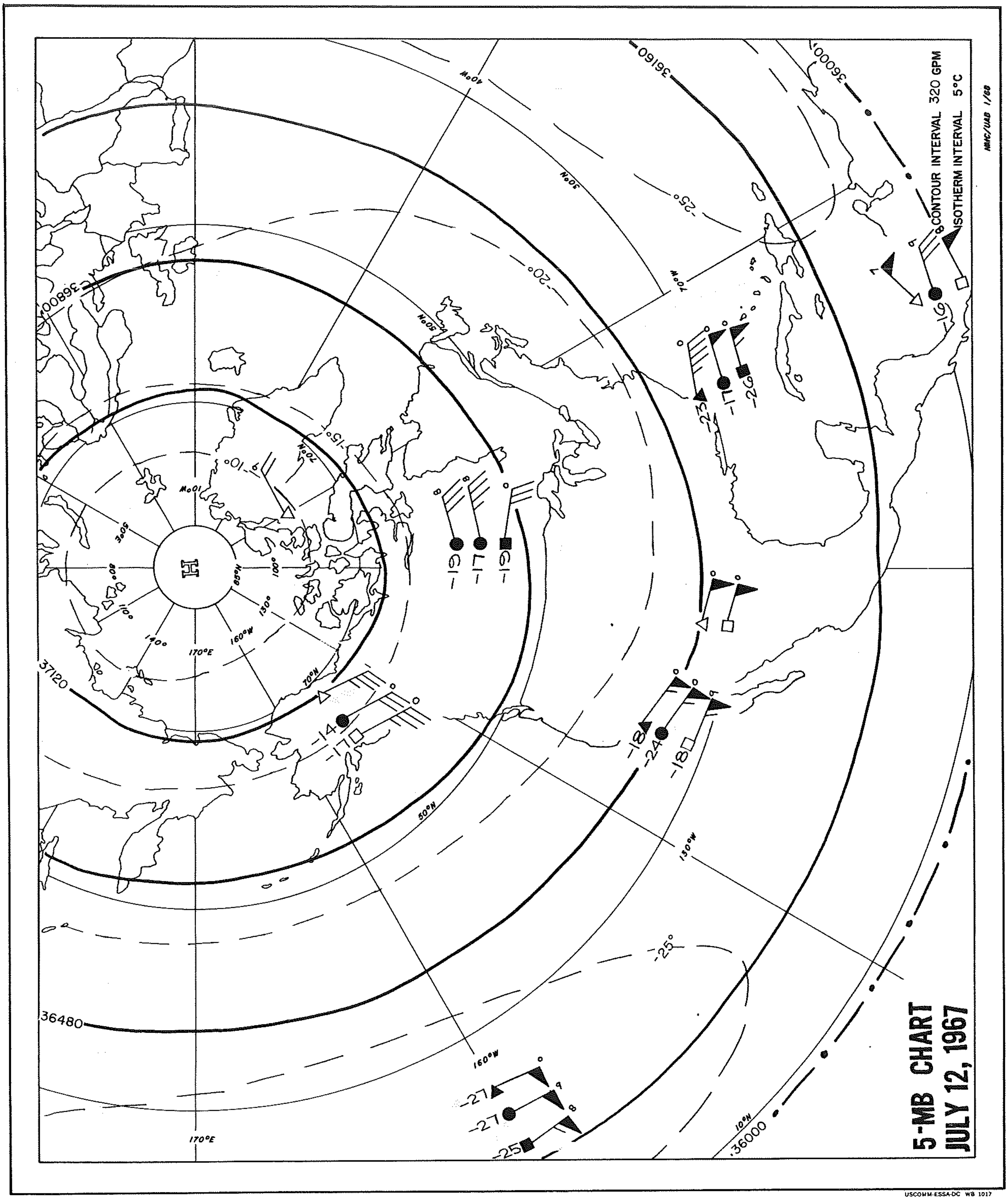
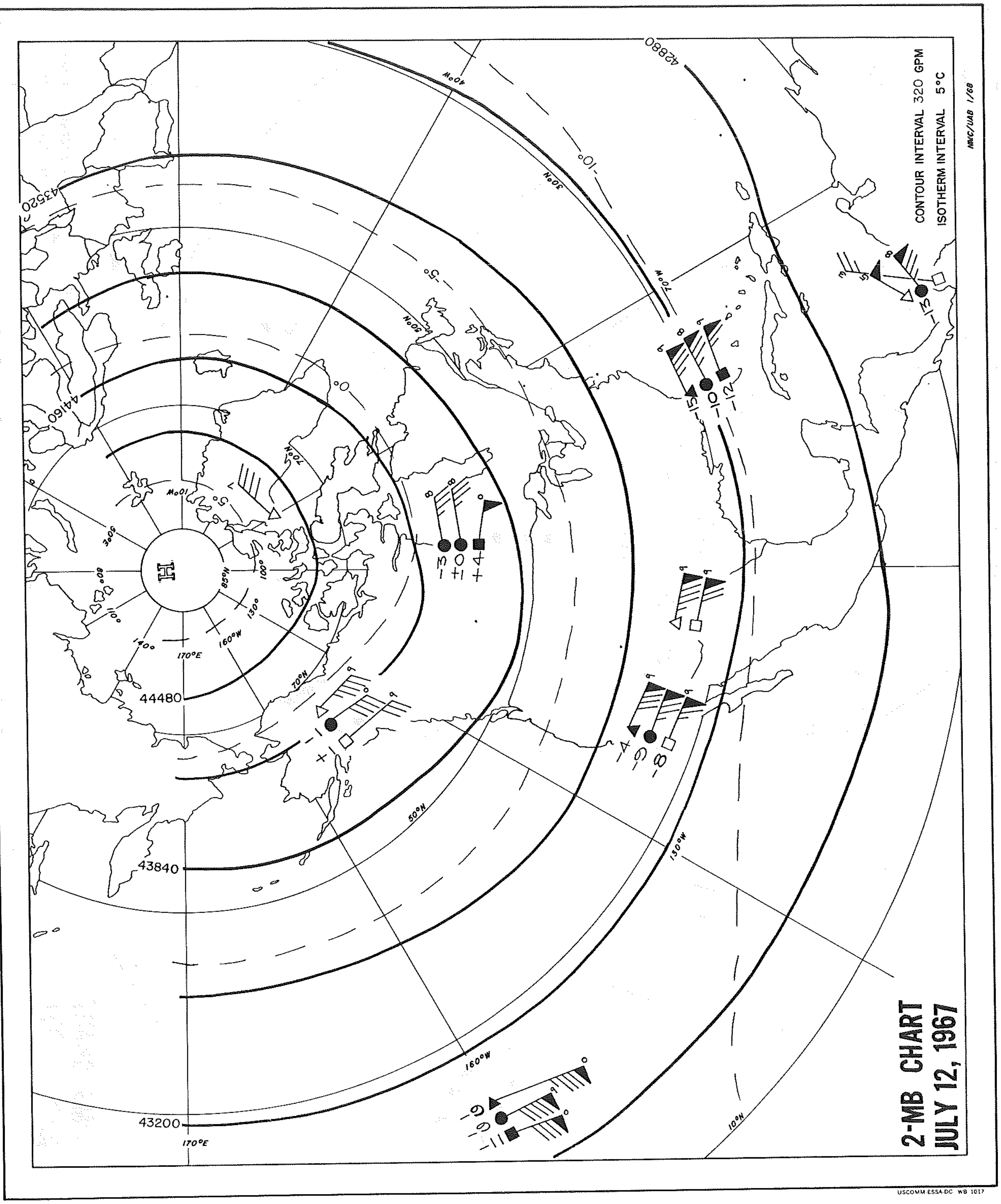
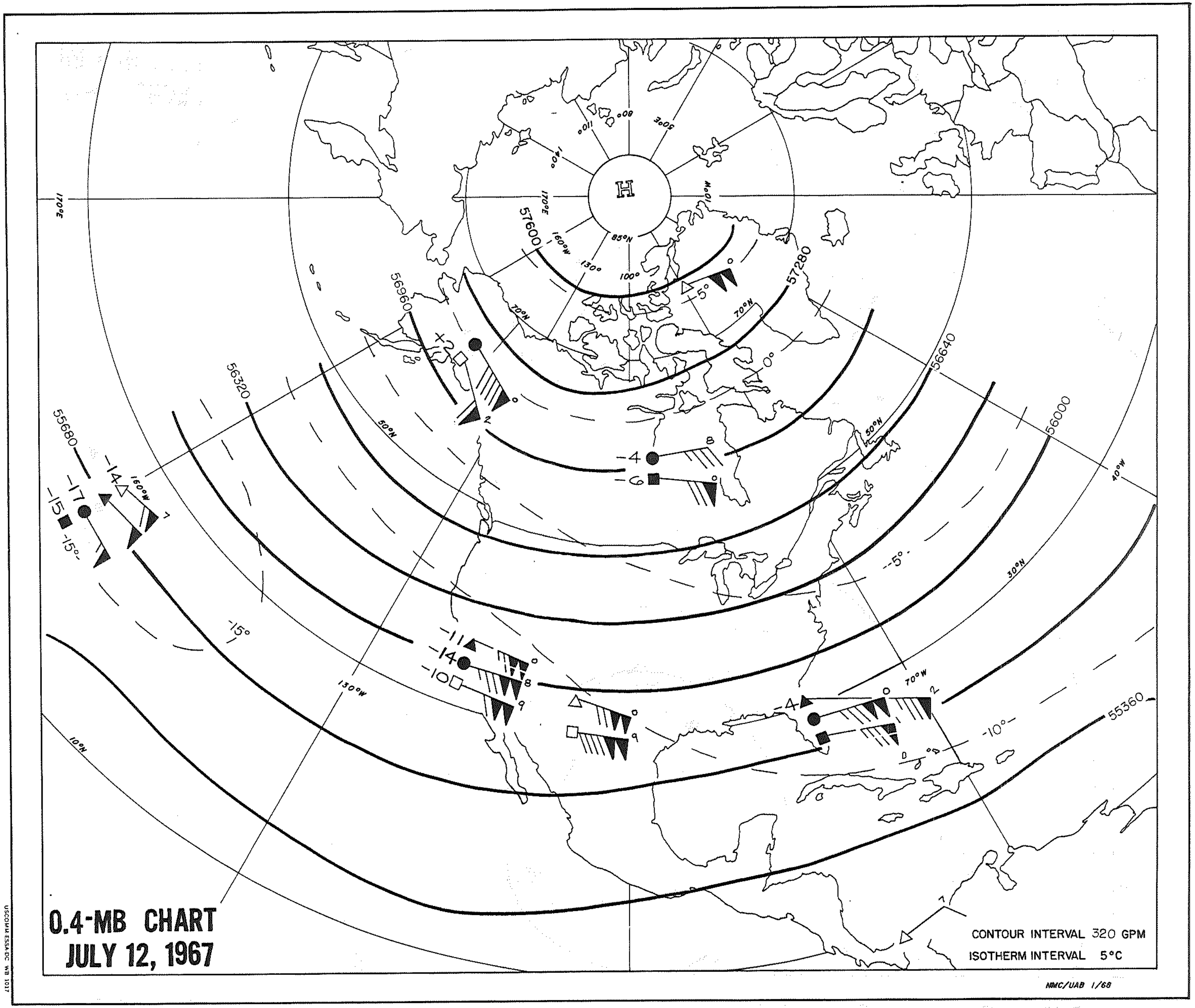
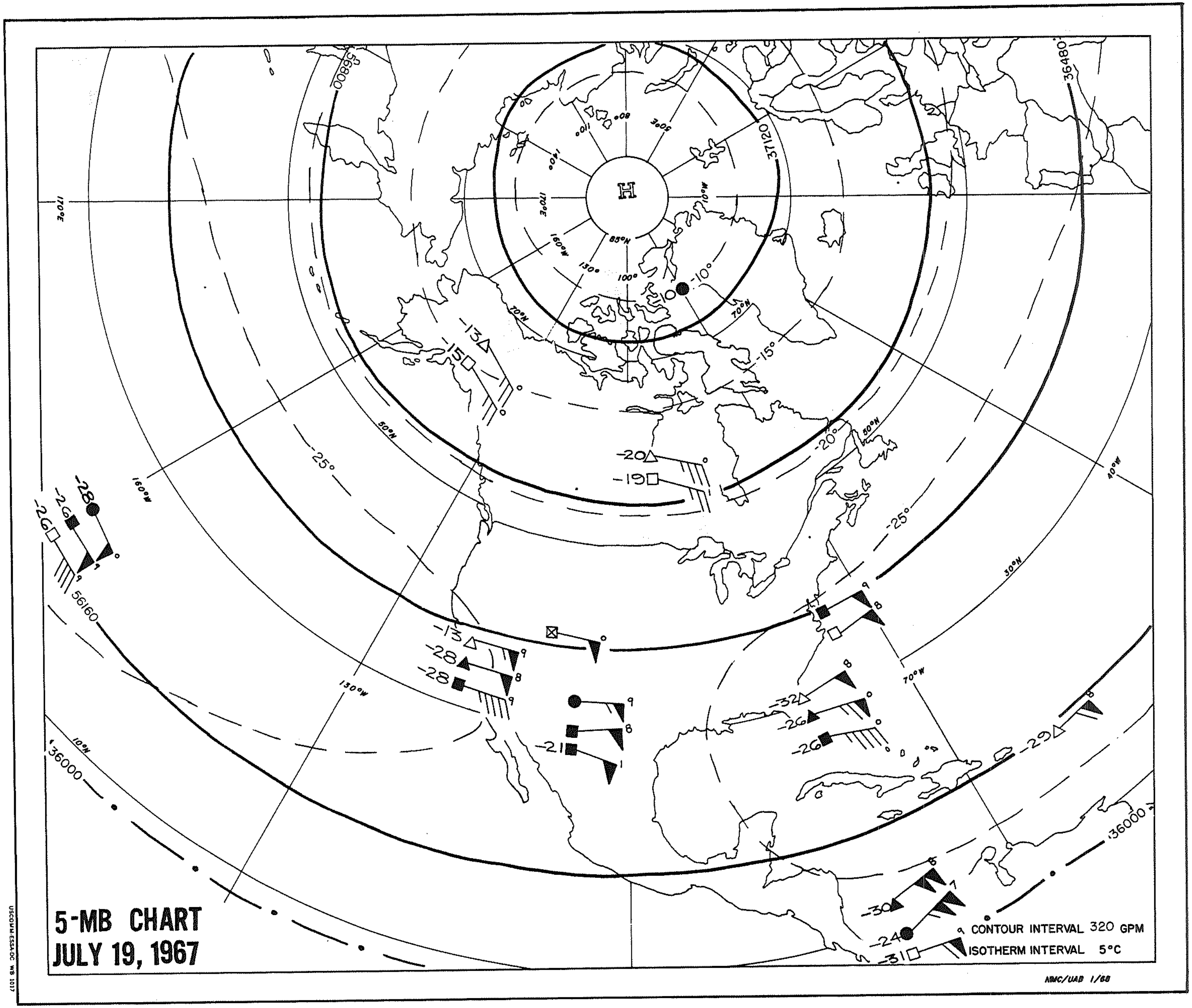
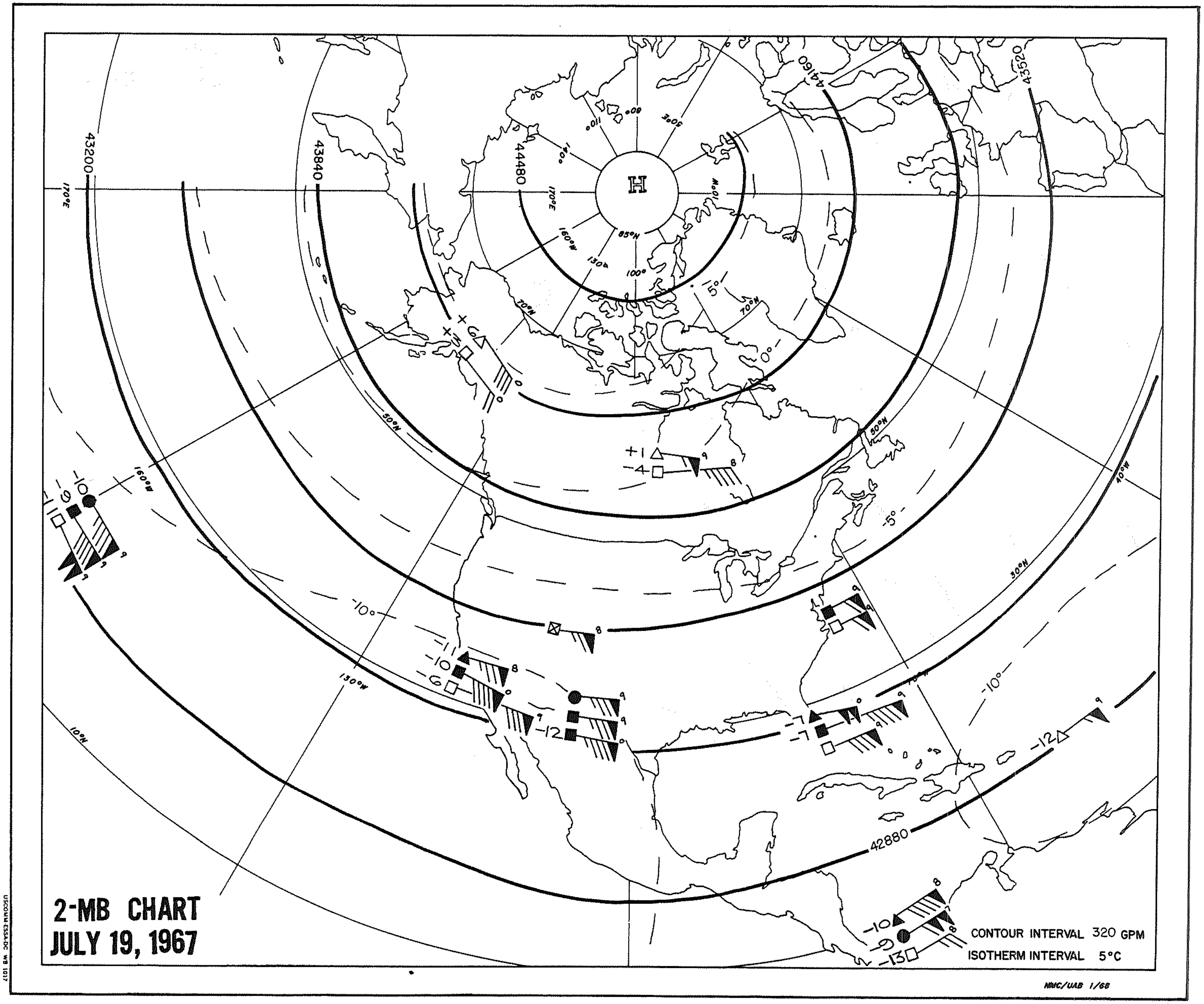

5-MB CHART
JULY 12, 1967
CONTOUR INTERVAL 320 GPM
ISOTHERM INTERVAL 5°C
36000
36160
36480
36800
37120
H
USCOMM-ESSA-DC WB 1017


2-MB CHART
JULY 12, 1967
CONTOUR INTERVAL 320 GPM
ISOTHERM INTERVAL 5°C
NMC/UAB 1/68
USCOMM-ESSA-DC WB 1017
44480
44160
43840
43520
43200
42880

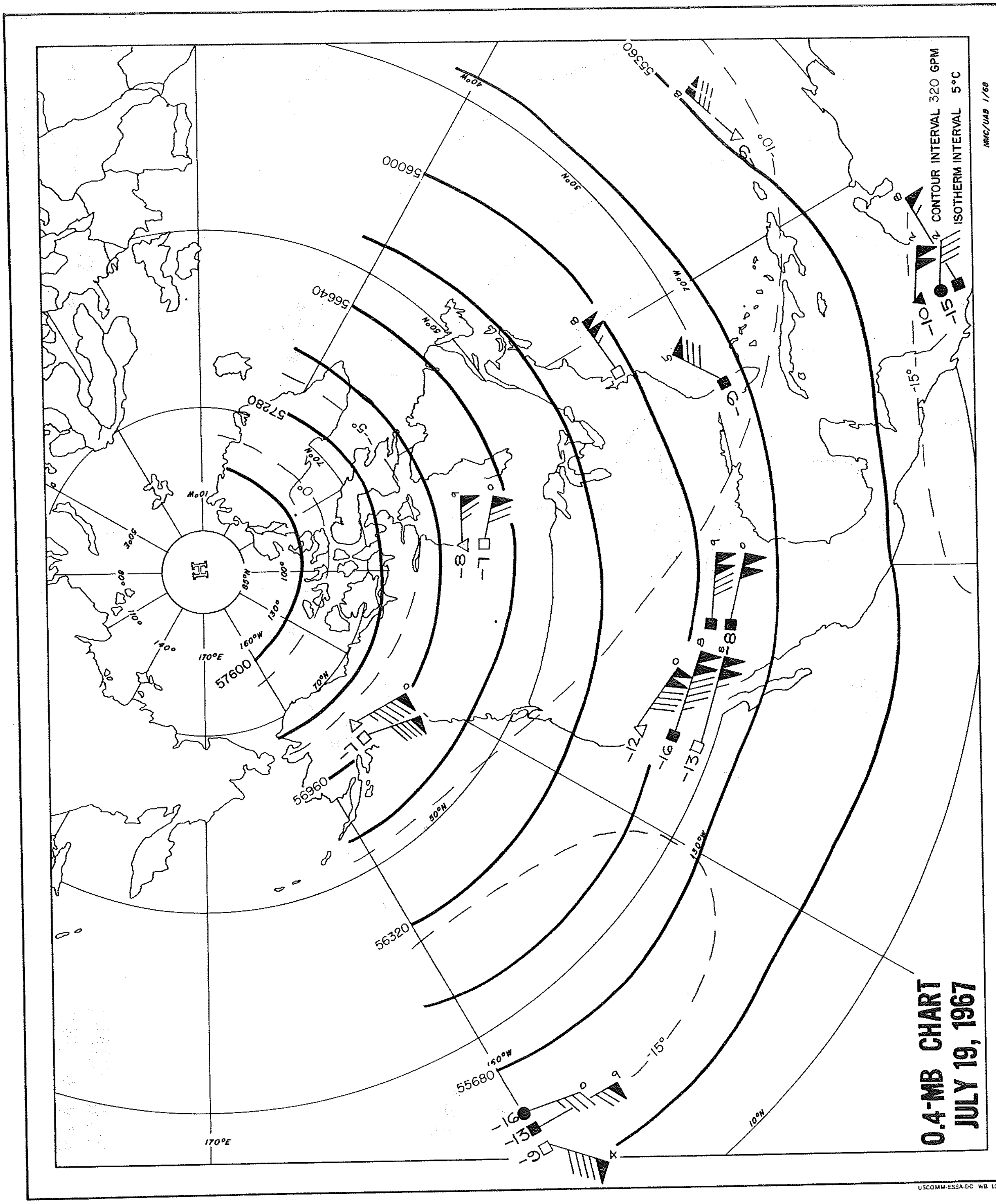


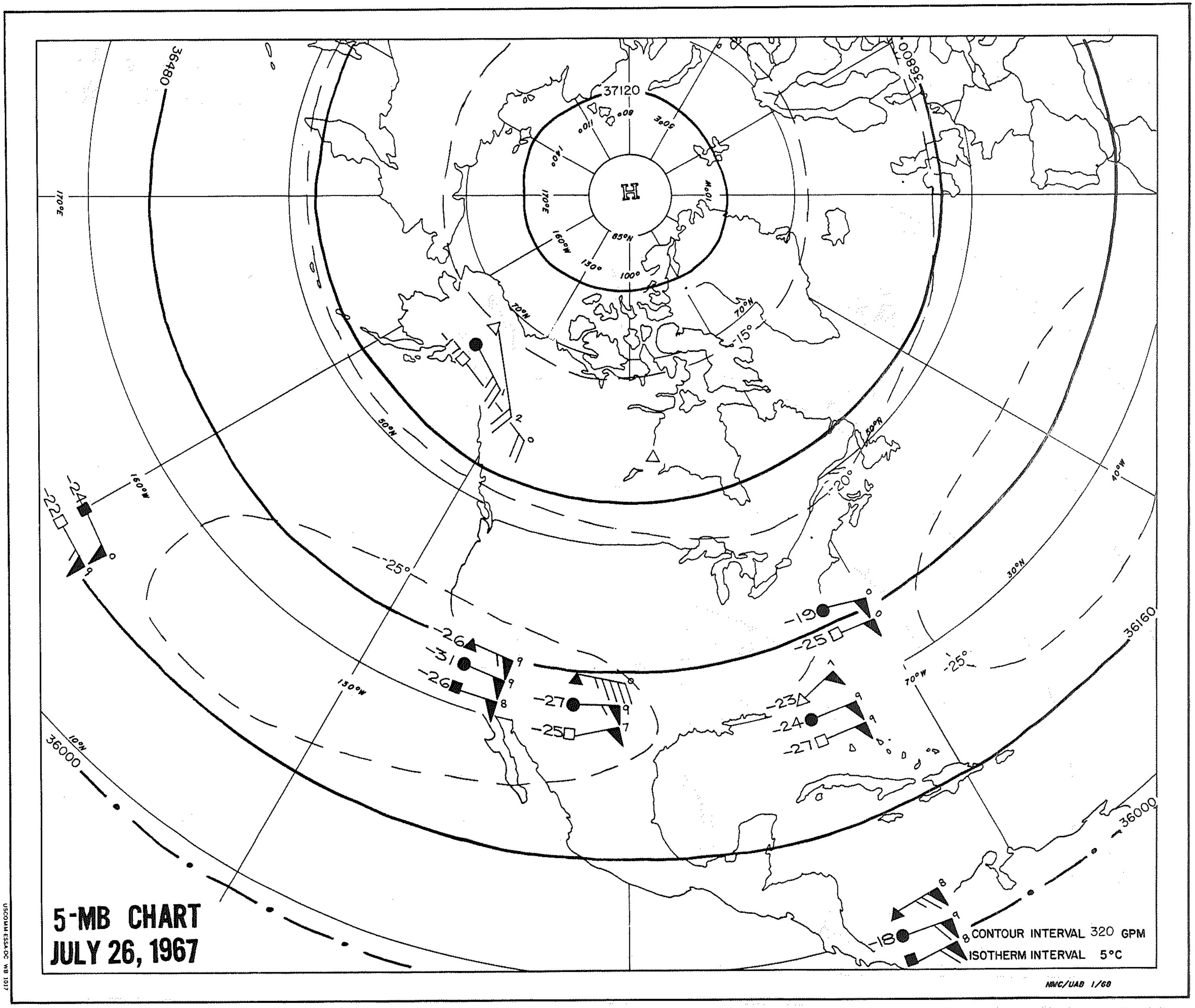
0.4-MB CHART
JULY 12, 1967
CONTOUR INTERVAL 320 GPM
ISOTHERM INTERVAL 5°C
NMC/UAB 1/68
57600
57280
56960
56640
56320
56000
55680
55360

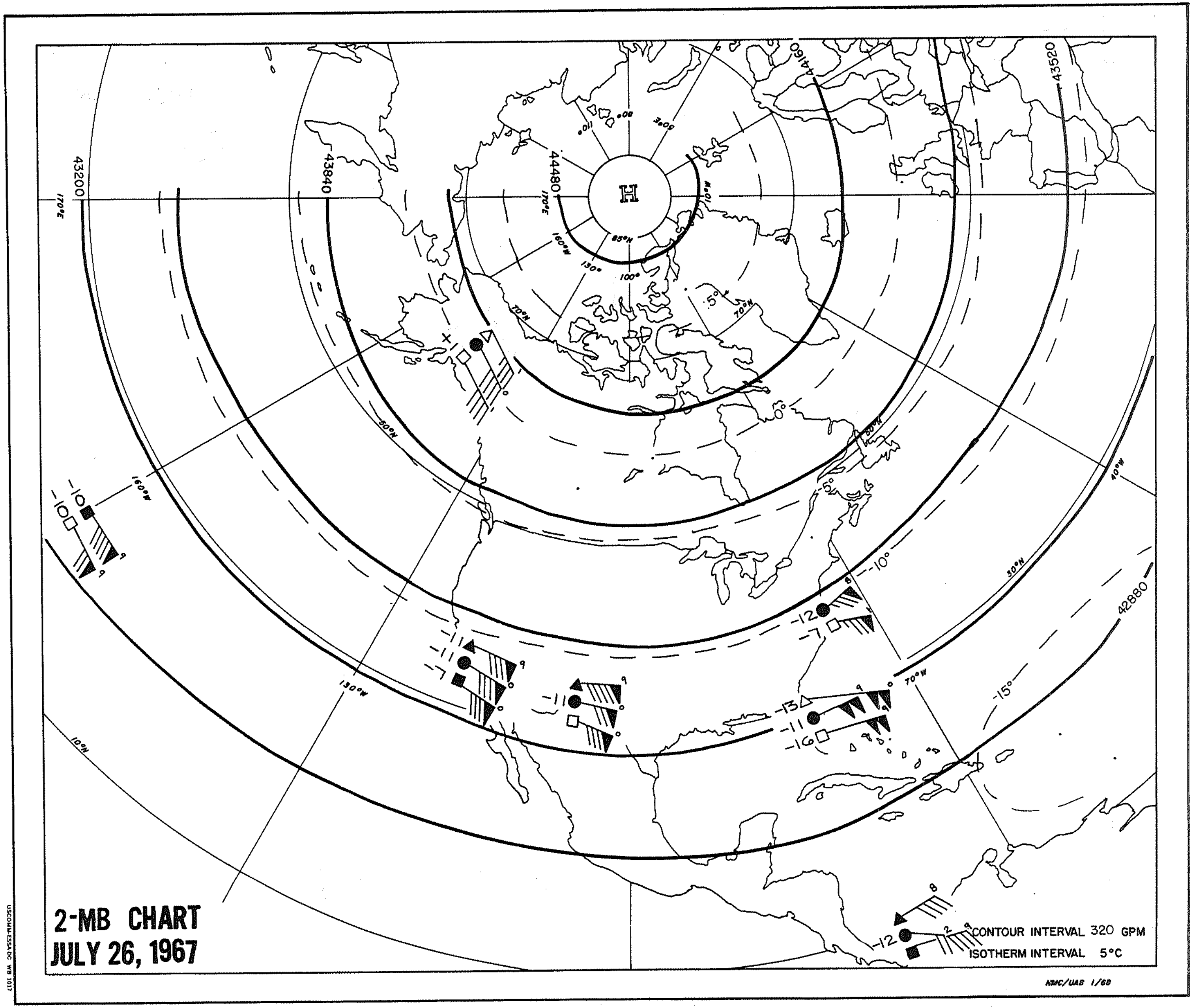

5-MB CHART
JULY 19, 1967
CONTOUR INTERVAL 320 GPM
ISOTHERM INTERVAL 5°C
NMC/UAD 1/68
USCOMM-ESSA-DC WB 1017

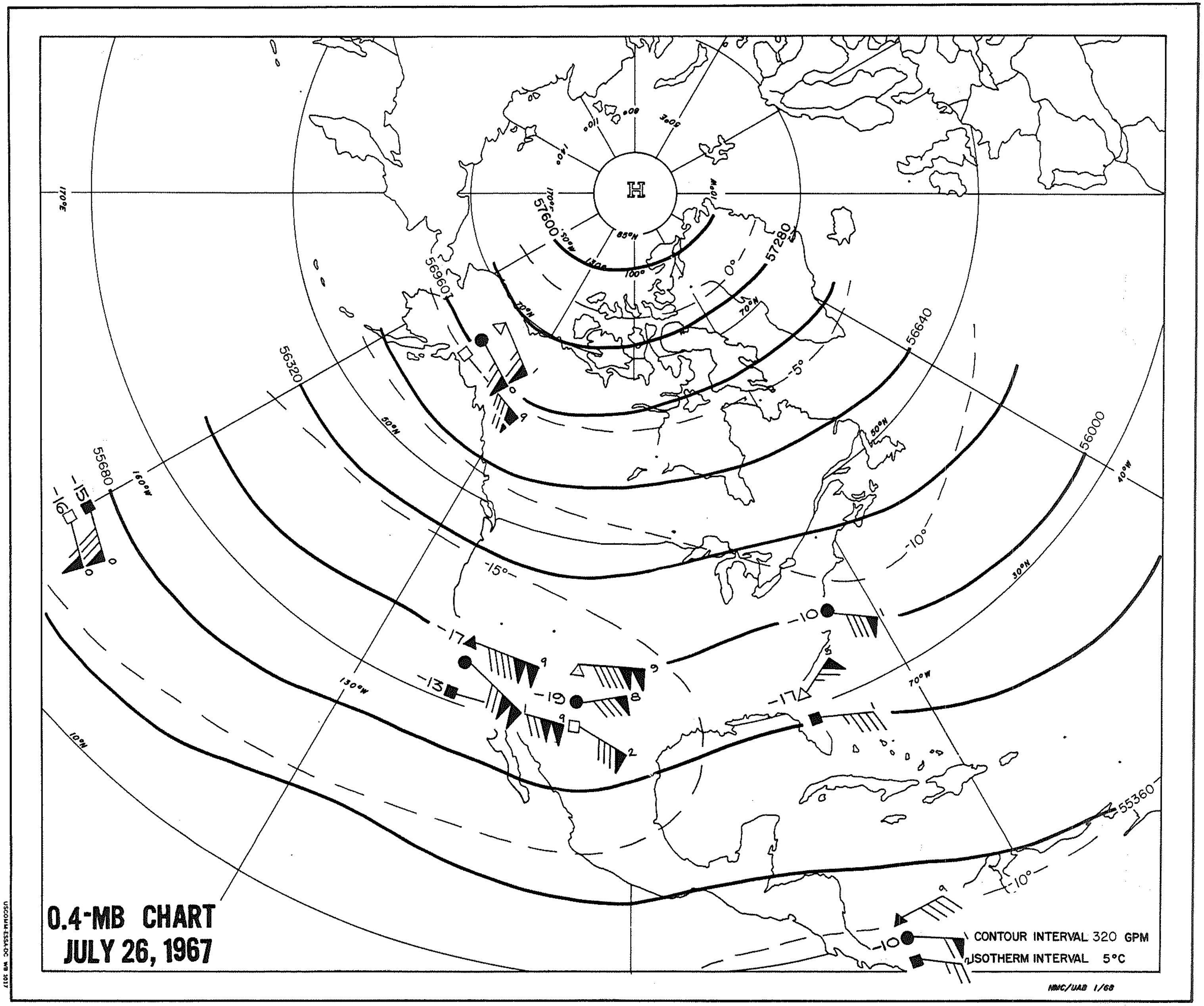


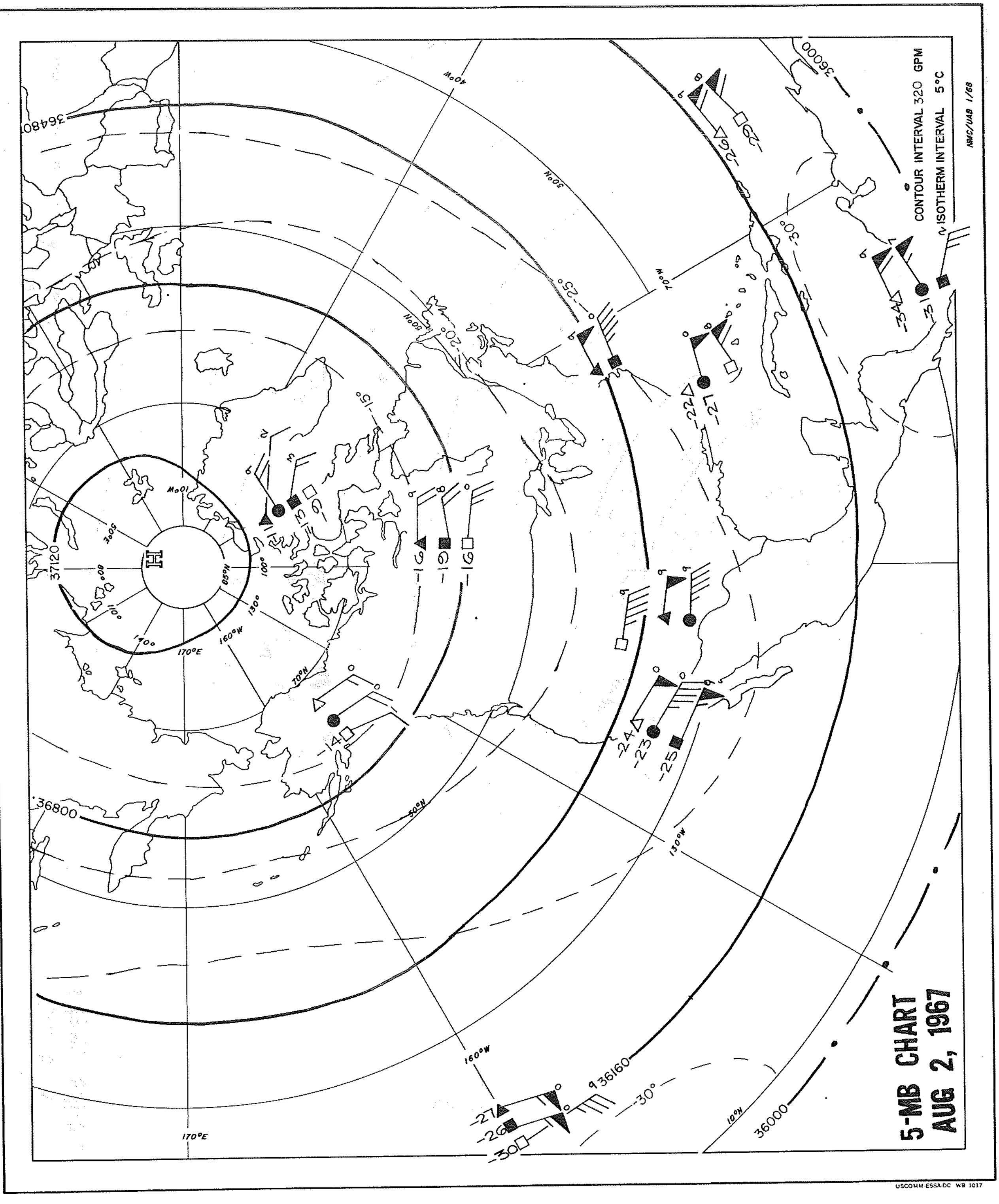
2-MB CHART
JULY 19, 1967
CONTOUR INTERVAL 320 GPM
ISOTHERM INTERVAL 5°C
43200
43840
44480
44160
43520
42880
H
-10°
-5°
0°
5°
-12
NMC/UAB 1/68


0.4-MB CHART
JULY 19, 1967
CONTOUR INTERVAL 320 GPM
ISOTHERM INTERVAL 5°C
NMC/UAB 1/68
57600
57280
56960
56640
56320
56000
55680
55360
USCOMM-ESSA-DC WB 1017

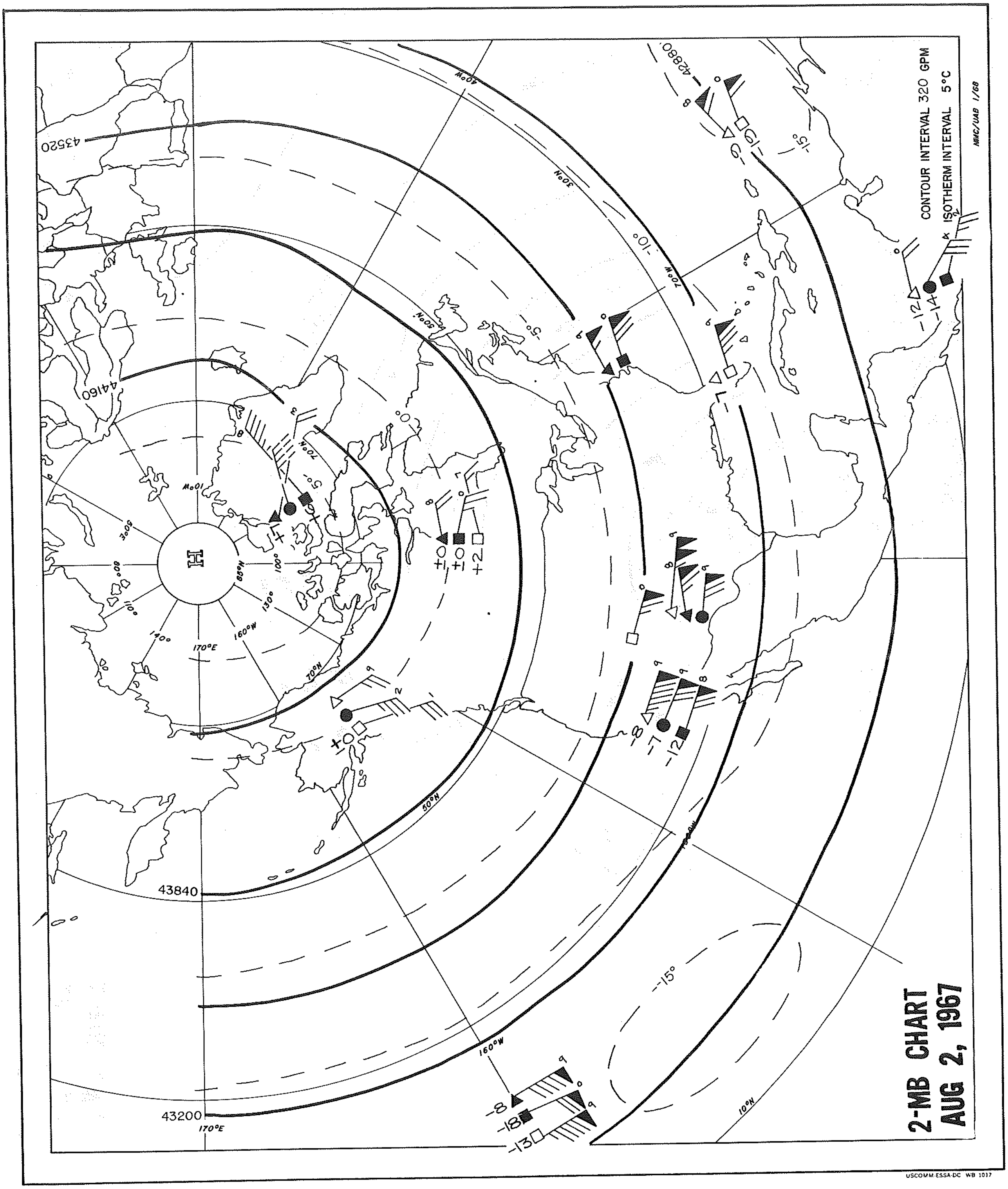

5-MB CHART
JULY 26, 1967
CONTOUR INTERVAL 320 GPM
ISOTHERM INTERVAL 5°C
NMC/UAB 1/68
37120
36480
36800
36160
36000
-15°
-20°
-25°
H
USCOMM ESSA DC WB 1017

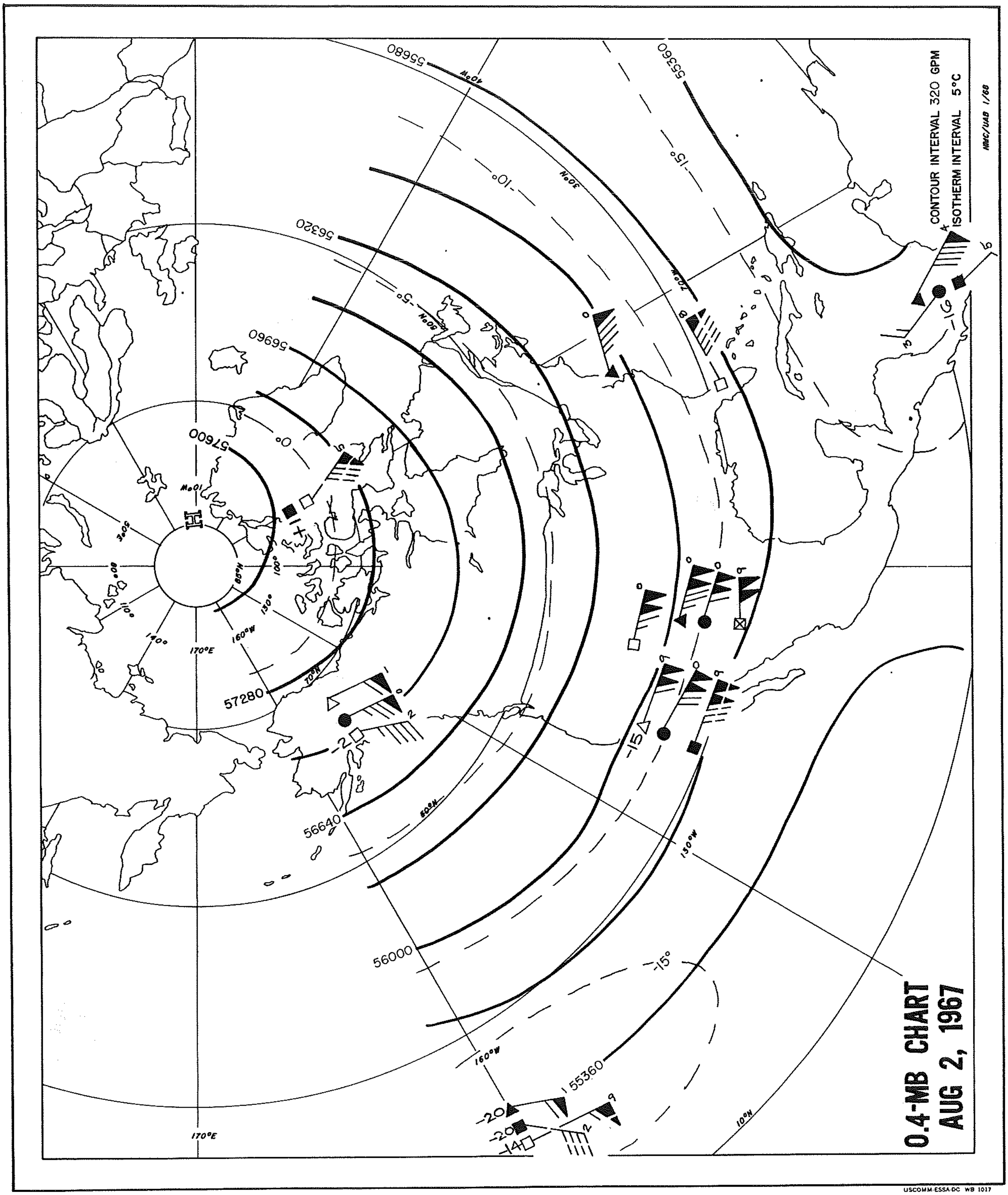

2-MB CHART
JULY 26, 1967
CONTOUR INTERVAL 320 GPM
ISOTHERM INTERVAL 5°C
43200
43840
44480
44160
43520
42880
H
170°E
160°W
130°W
10°N
30°N
40°N
50°N
70°N
85°N
70°W
10°W
-5°
-10°
-15°
NMC/UAB 1/68
USCOMM-ESSA-DC WB 1017


0.4-MB CHART
JULY 26, 1967
CONTOUR INTERVAL 320 GPM
ISOTHERM INTERVAL 5°C
57600
57280
56960
56640
56320
56000
55680
55360
NMC/UAB 1/68

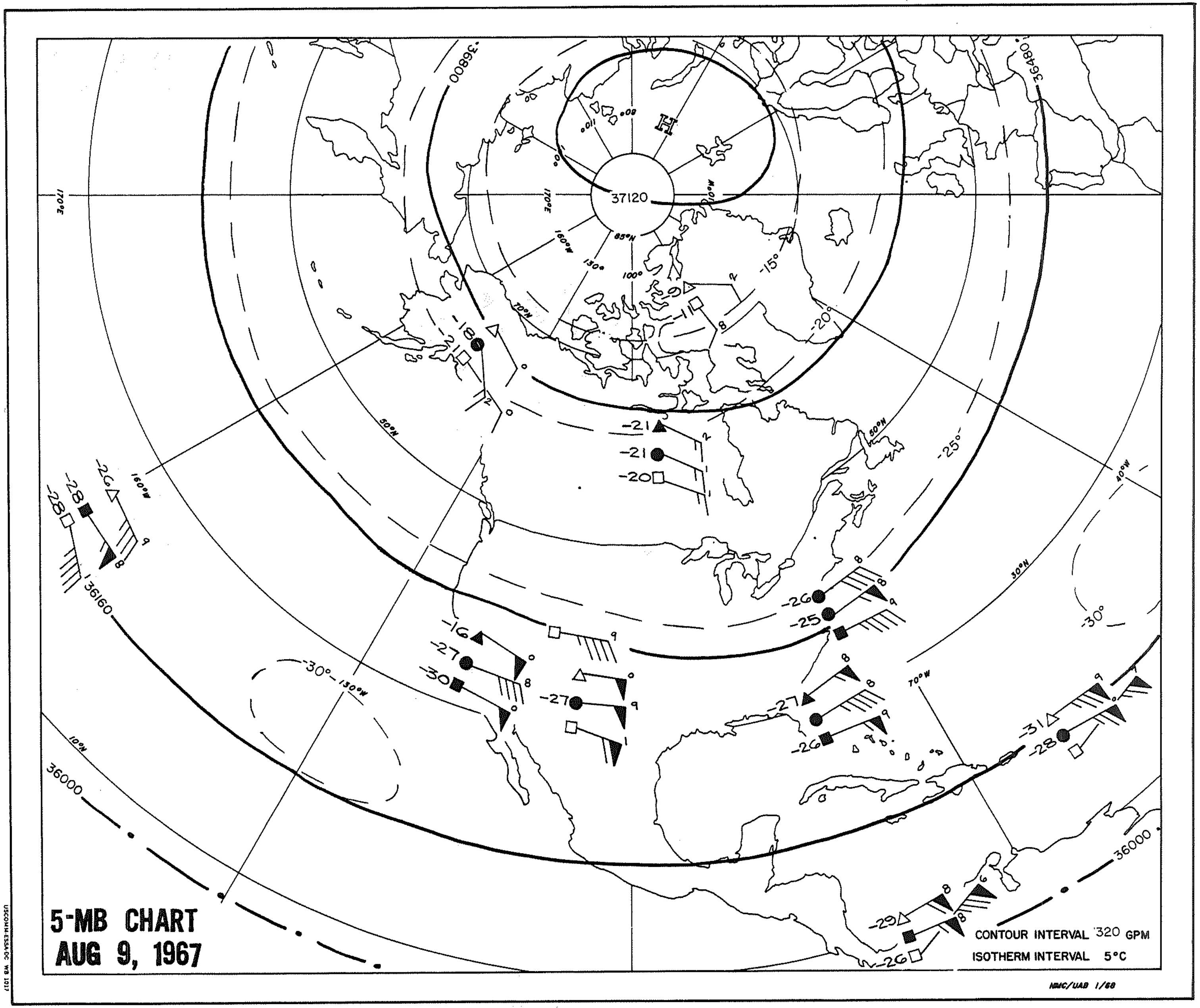


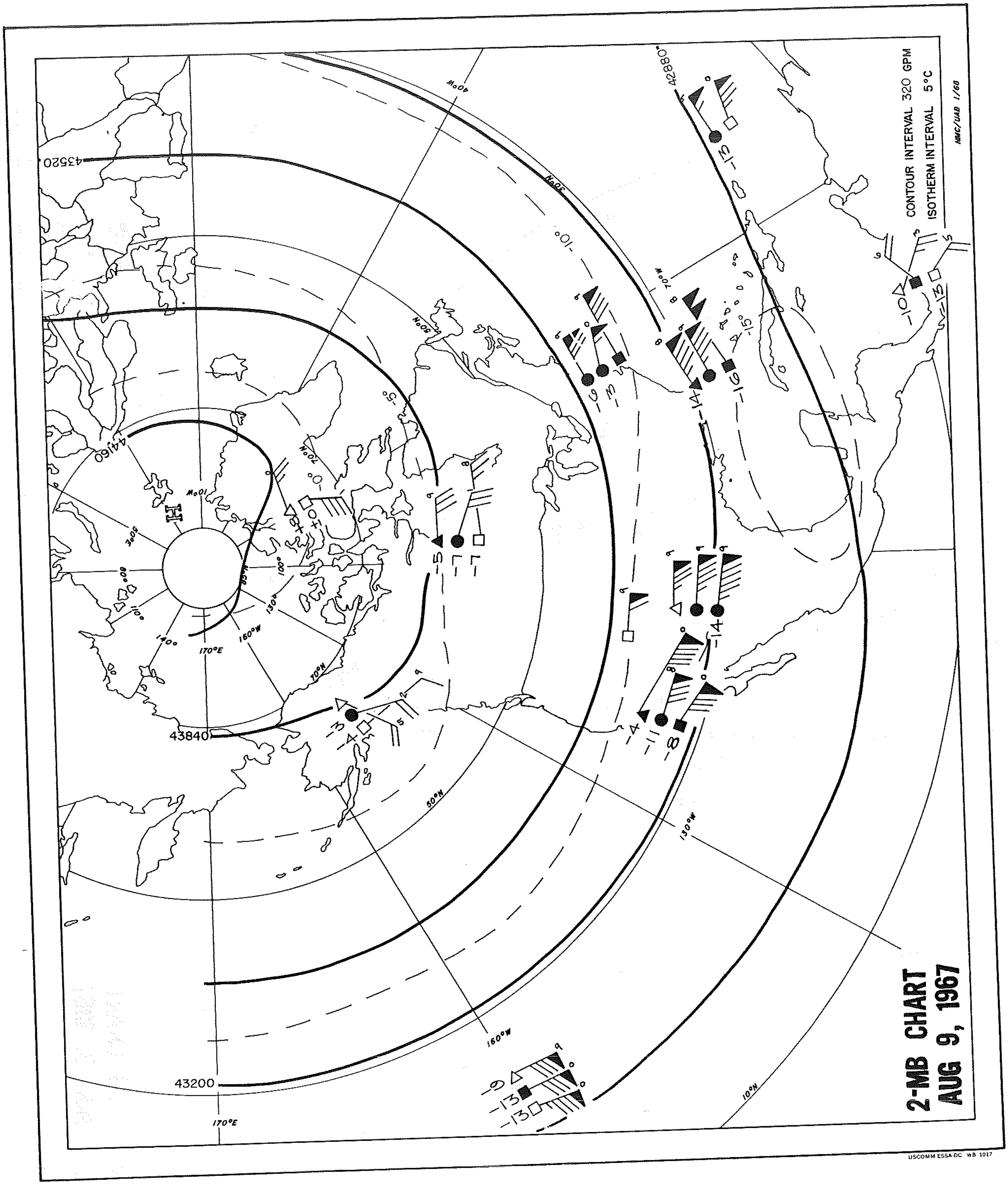
USCOMM-ESSA-DC WB 1017

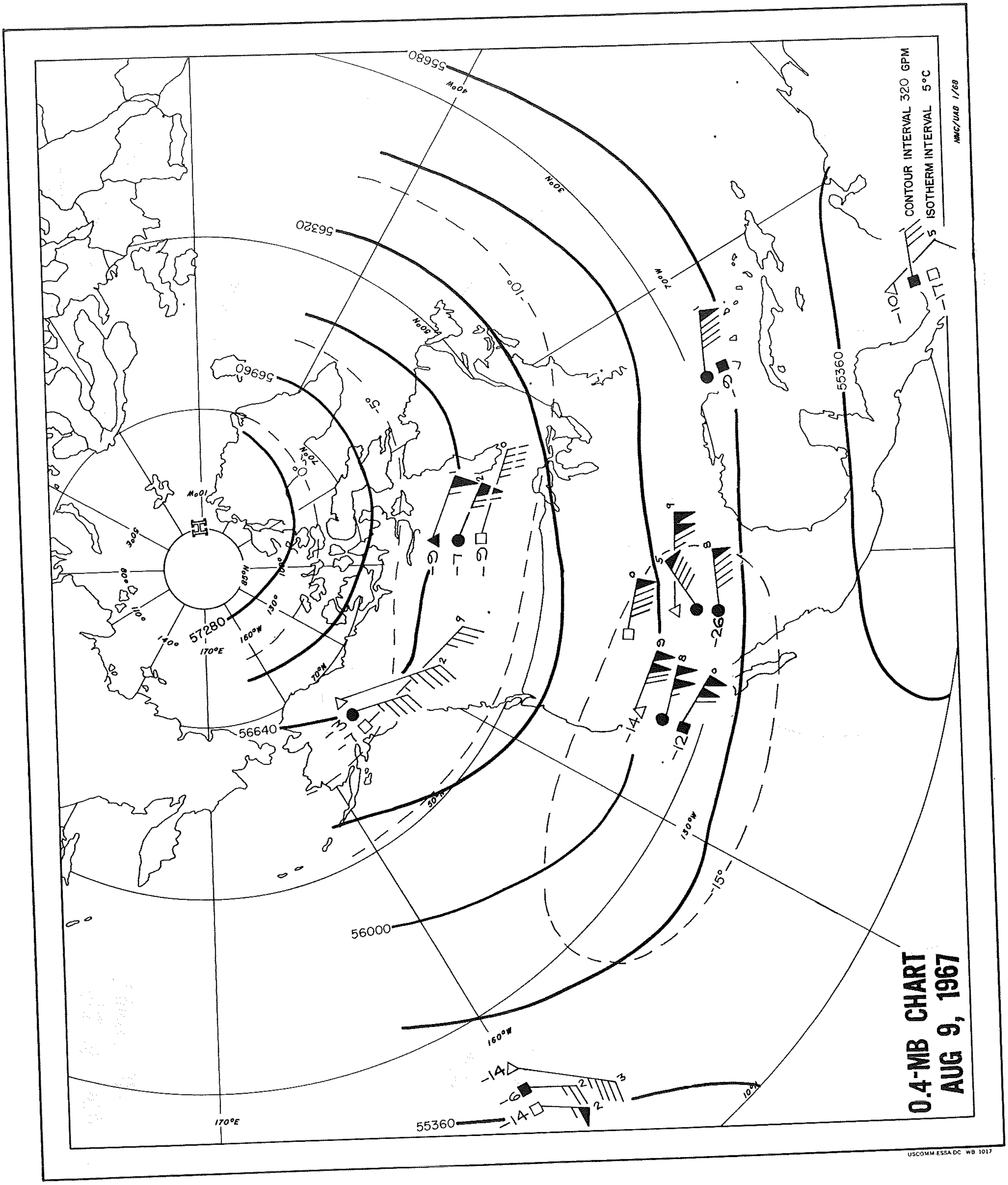

2-MB CHART
AUG 2, 1967
CONTOUR INTERVAL 320 GPM
ISOTHERM INTERVAL 5°C
NMC/UAB 1/68
43520
44160
43840
43200
42880

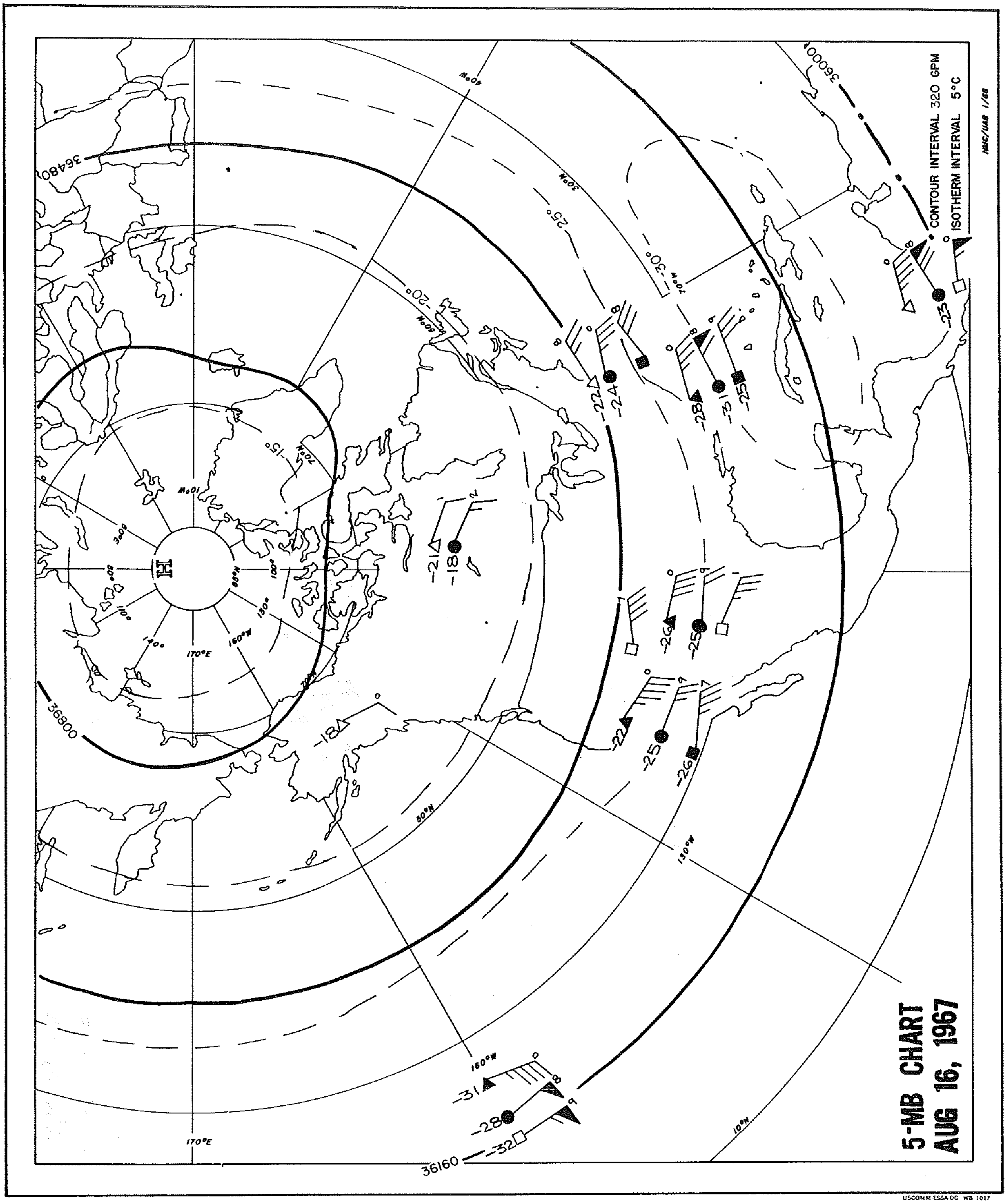


USCOMM-ESSA-DC WB 1017


5-MB CHART
AUG 9, 1967
CONTOUR INTERVAL 320 GPM
ISOTHERM INTERVAL 5°C
37120
36800
36480
36160
36000
H
-15°
-20°
-25°
-30°
NMC/UAB 1/68
USCOMM-ESSA-DC WB 1017


2-MB CHART
AUG 9, 1967
CONTOUR INTERVAL 320 GPM
ISOTHERM INTERVAL 5°C
NMC/UAB 1/68
43520
44160
43840
43200
42880
USCOMM-ESSA-DC WB 1017


0.4-MB CHART
AUG 9, 1967
CONTOUR INTERVAL 320 GPM
ISOTHERM INTERVAL 5°C
NMC/UAB 1/68
55680
56320
56960
57280
56640
56000
55360
55360
-10°
-5°
-15°
H
USCOMM-ESSA DC WB 1017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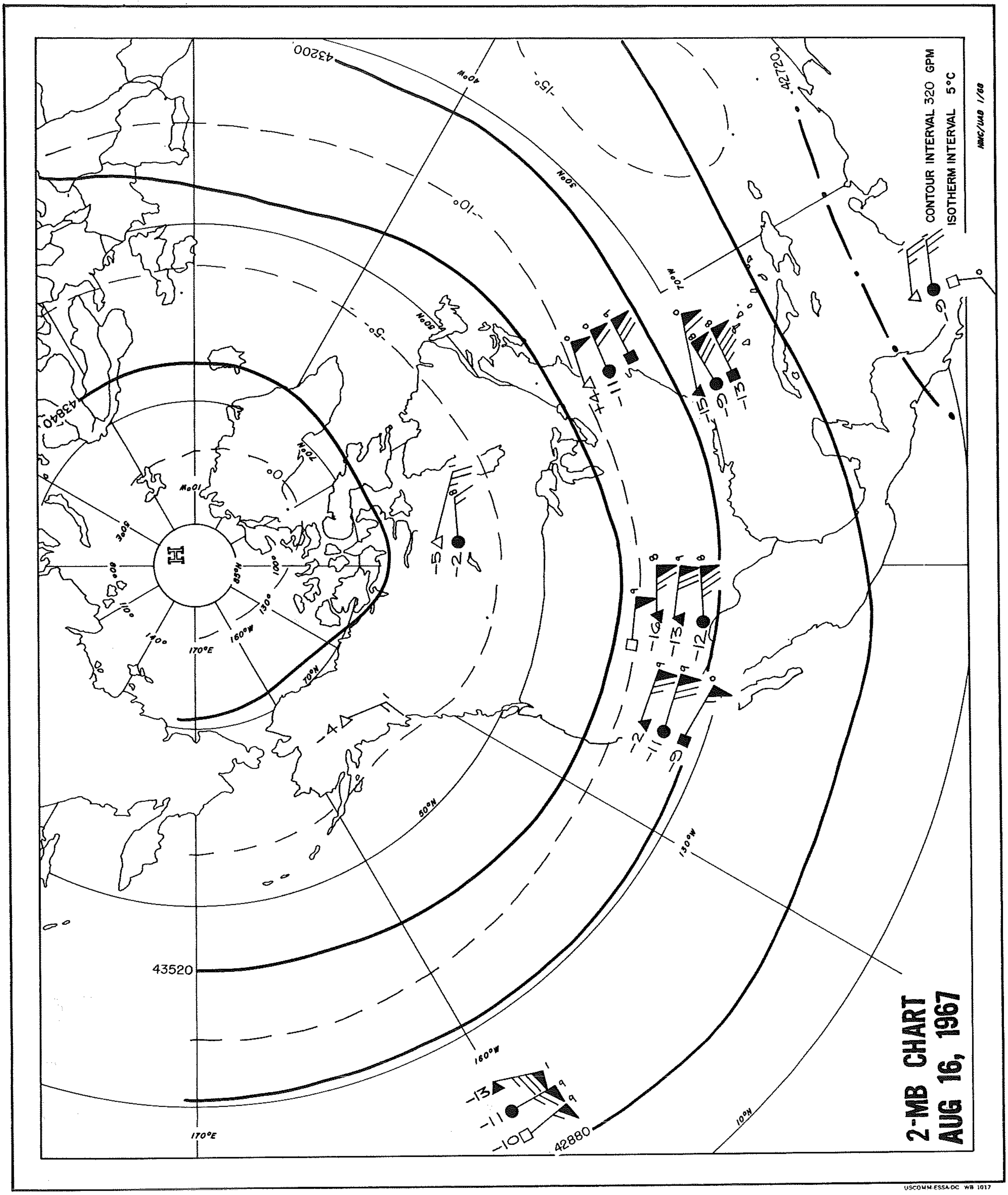
AUG 16, 1967
CONTOUR INTERVAL 320 GPM
ISOTHERM INTERVAL 5°C
USCOMM-ESSA-DC WB 1017



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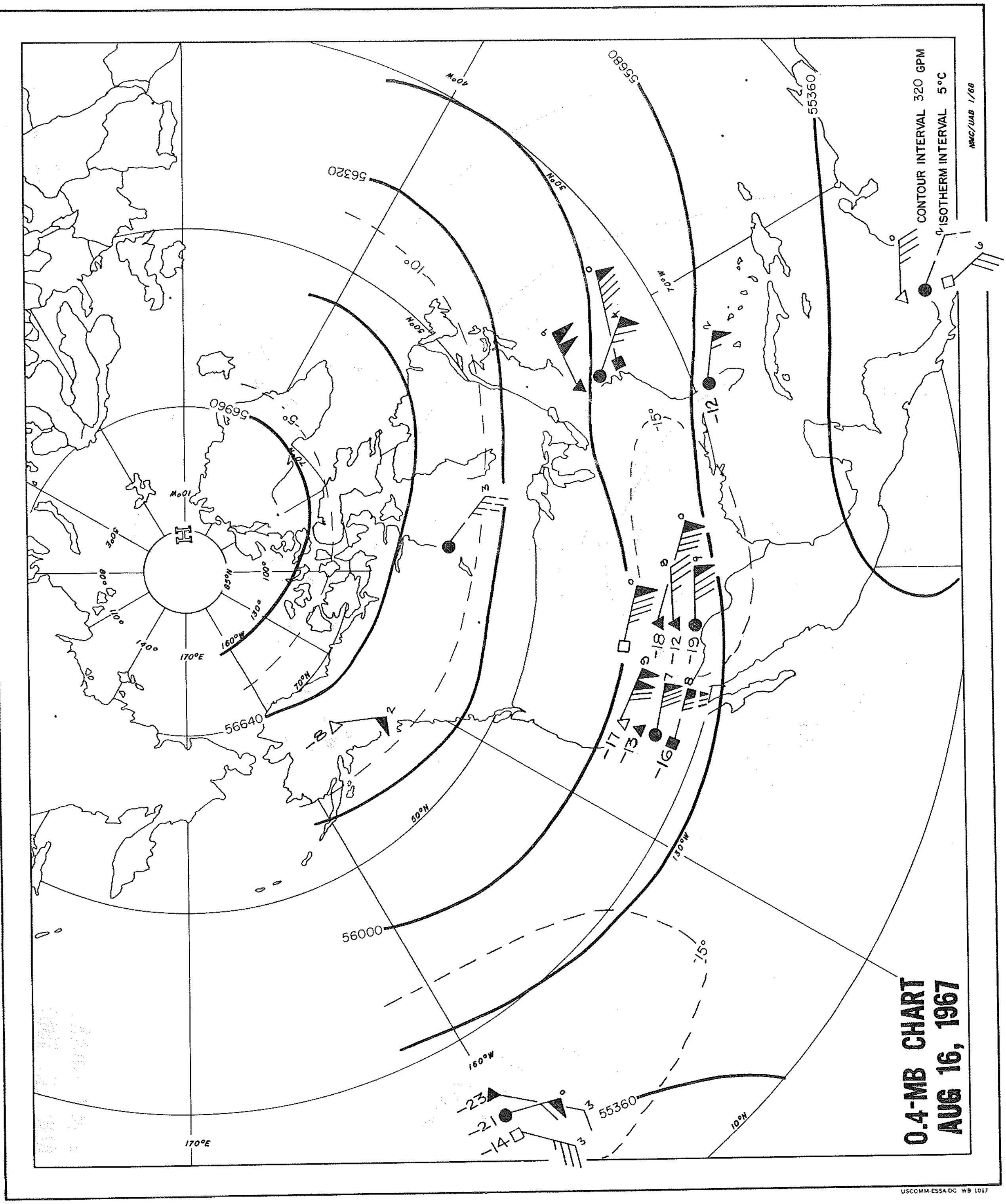
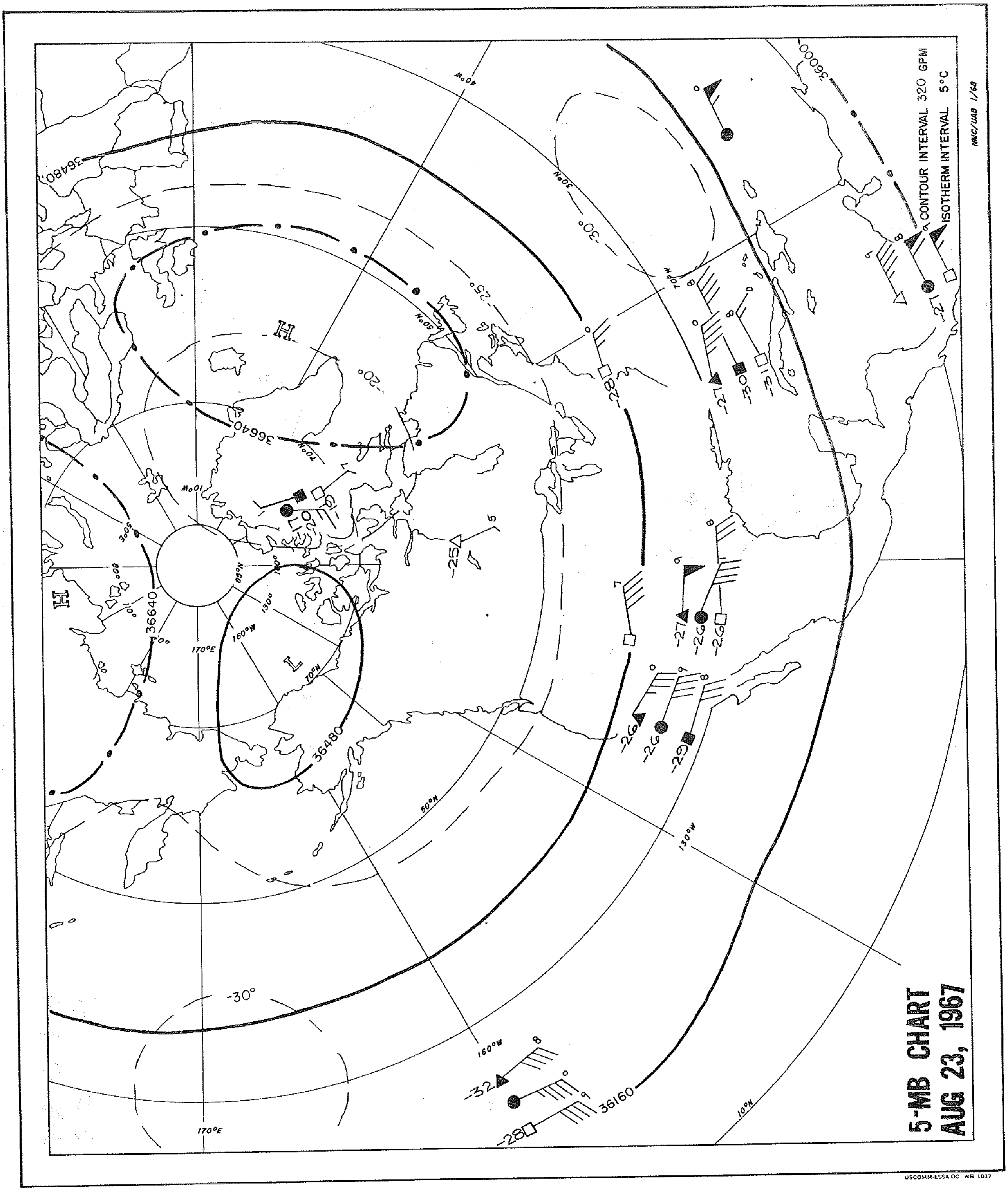

0.4-MB CHART
AUG 16, 1967
CONTOUR INTERVAL 320 GPM
ISOTHERM INTERVAL 5°C
NMC/UAB 1/68
55360
55680
56000
56320
56640
56960
H
USCOMM-ESSA DC WB 1017



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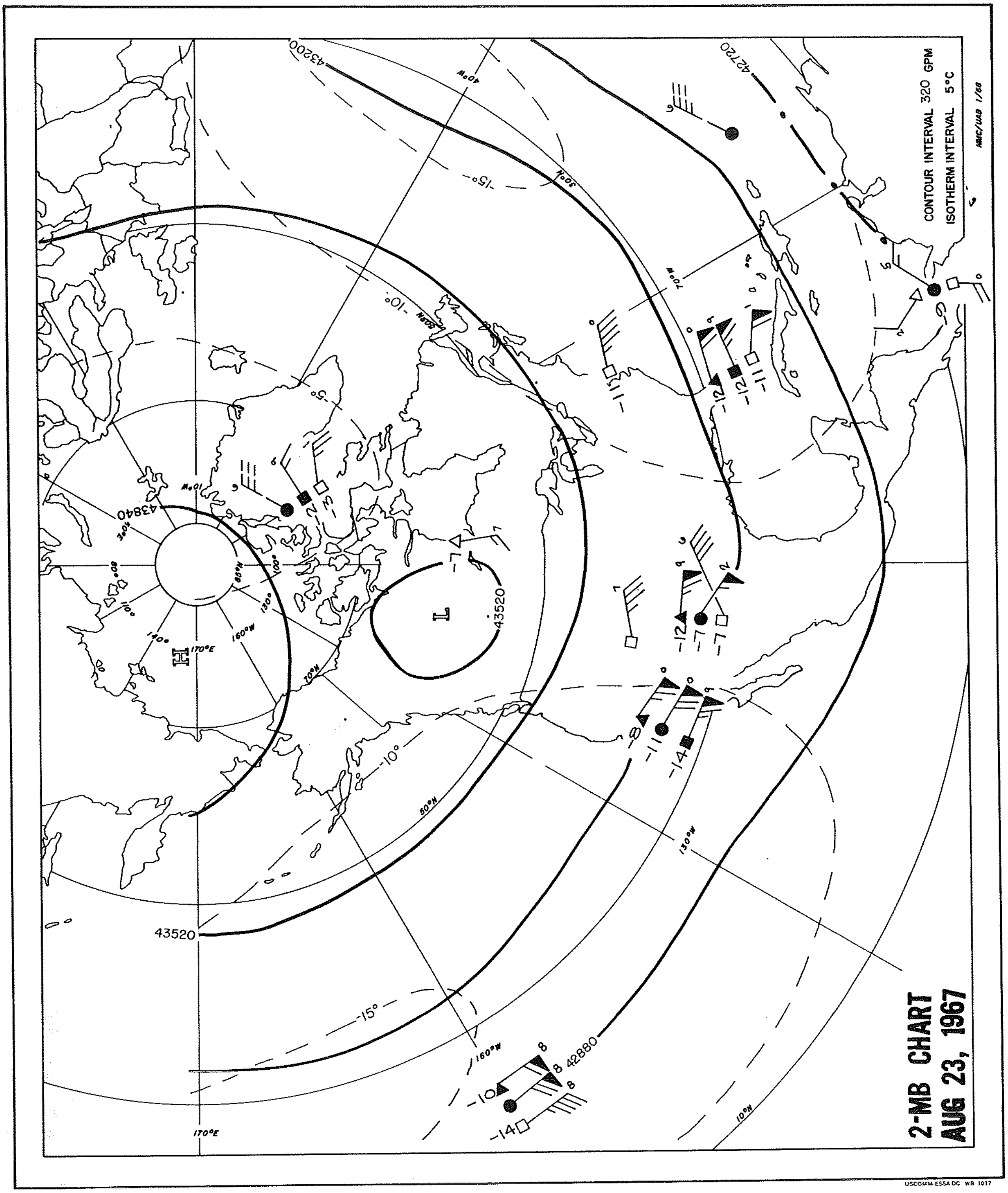
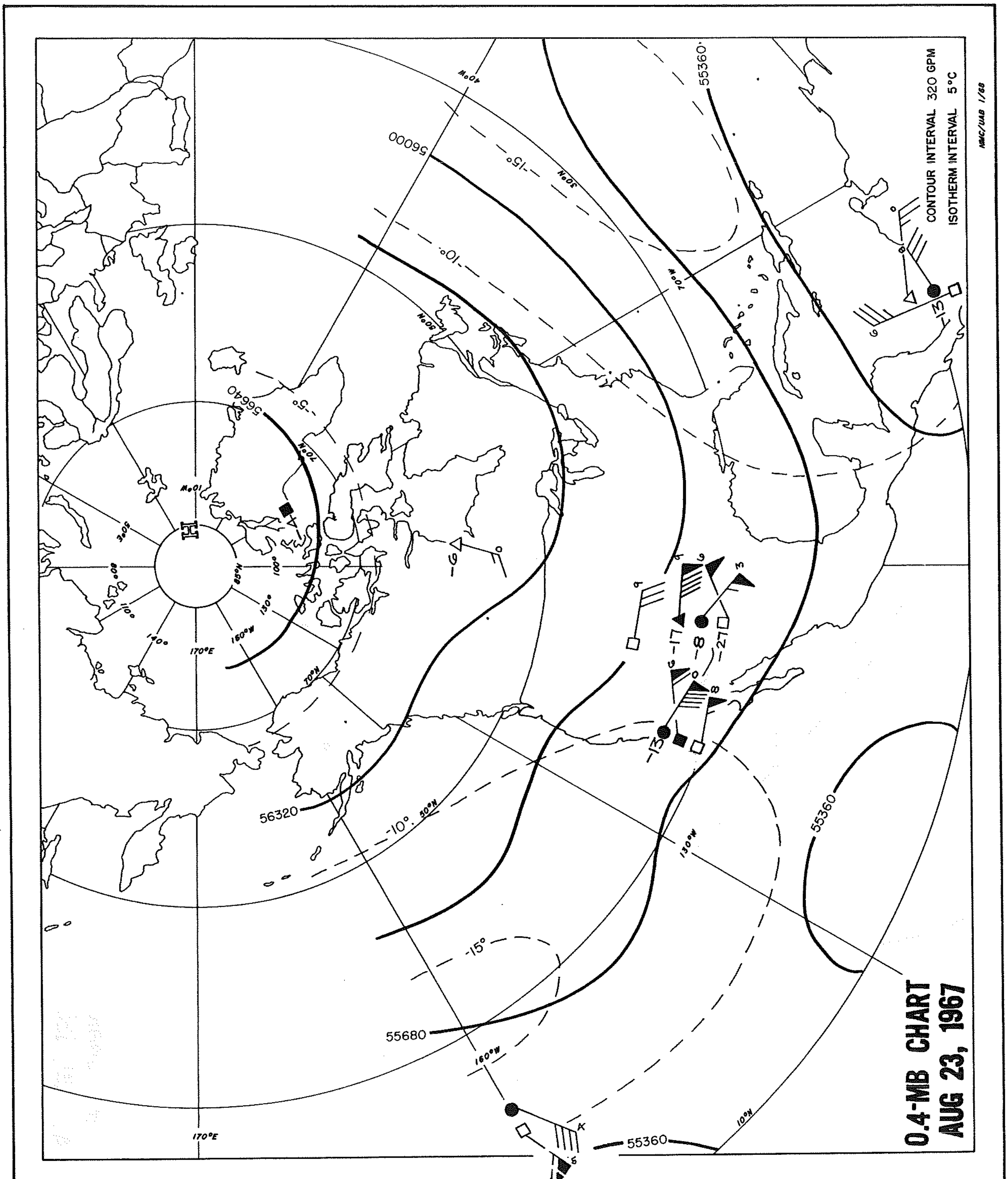

2-MB CHART
AUG 23, 1967
CONTOUR INTERVAL 320 GPM
ISOTHERM INTERVAL 5°C
43200
42720
43840
43520
43520
42880
L
H
-5°
-10°
-15°
-10°
-15°
USCOMM-ESSA-DC WB 1017



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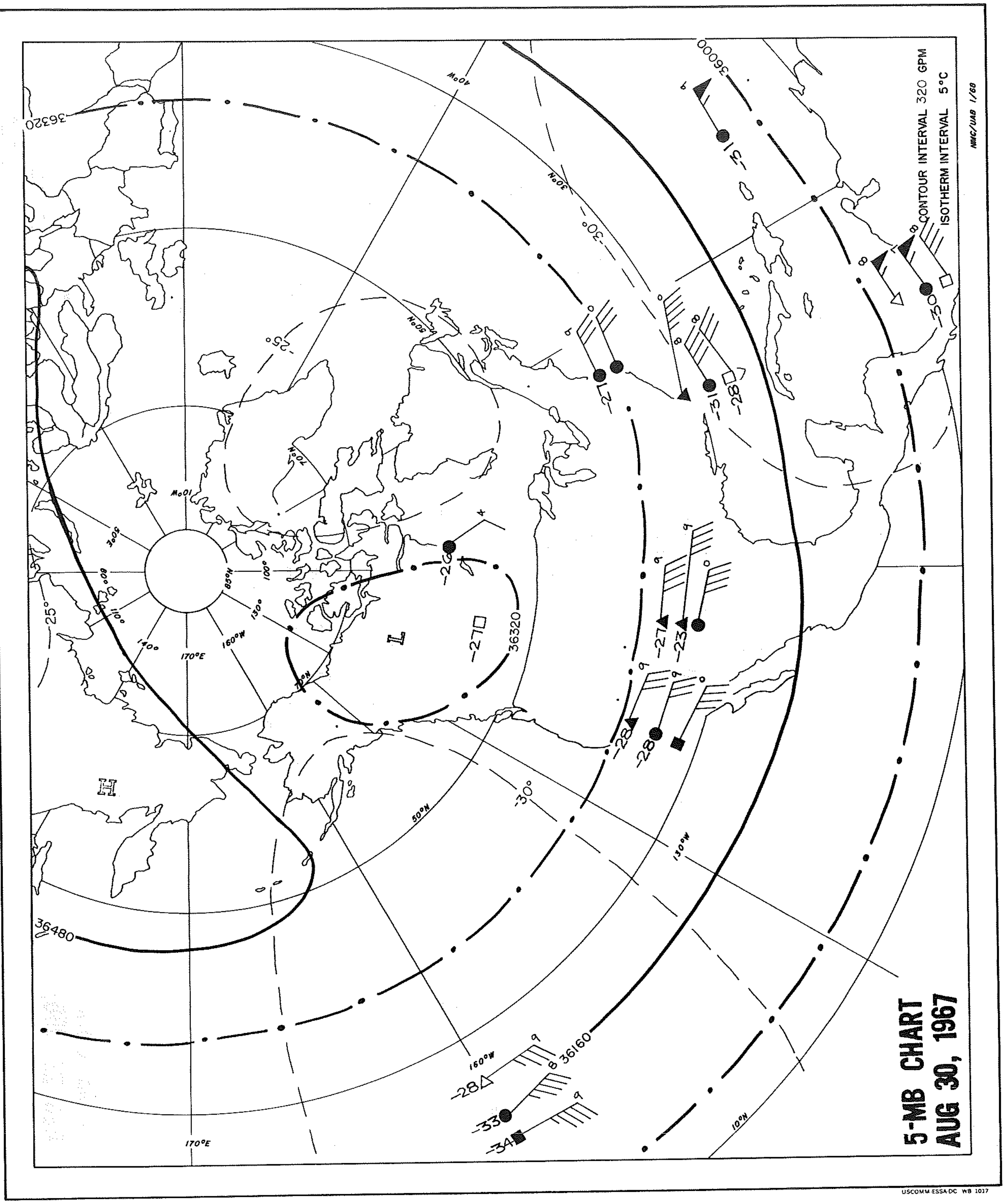
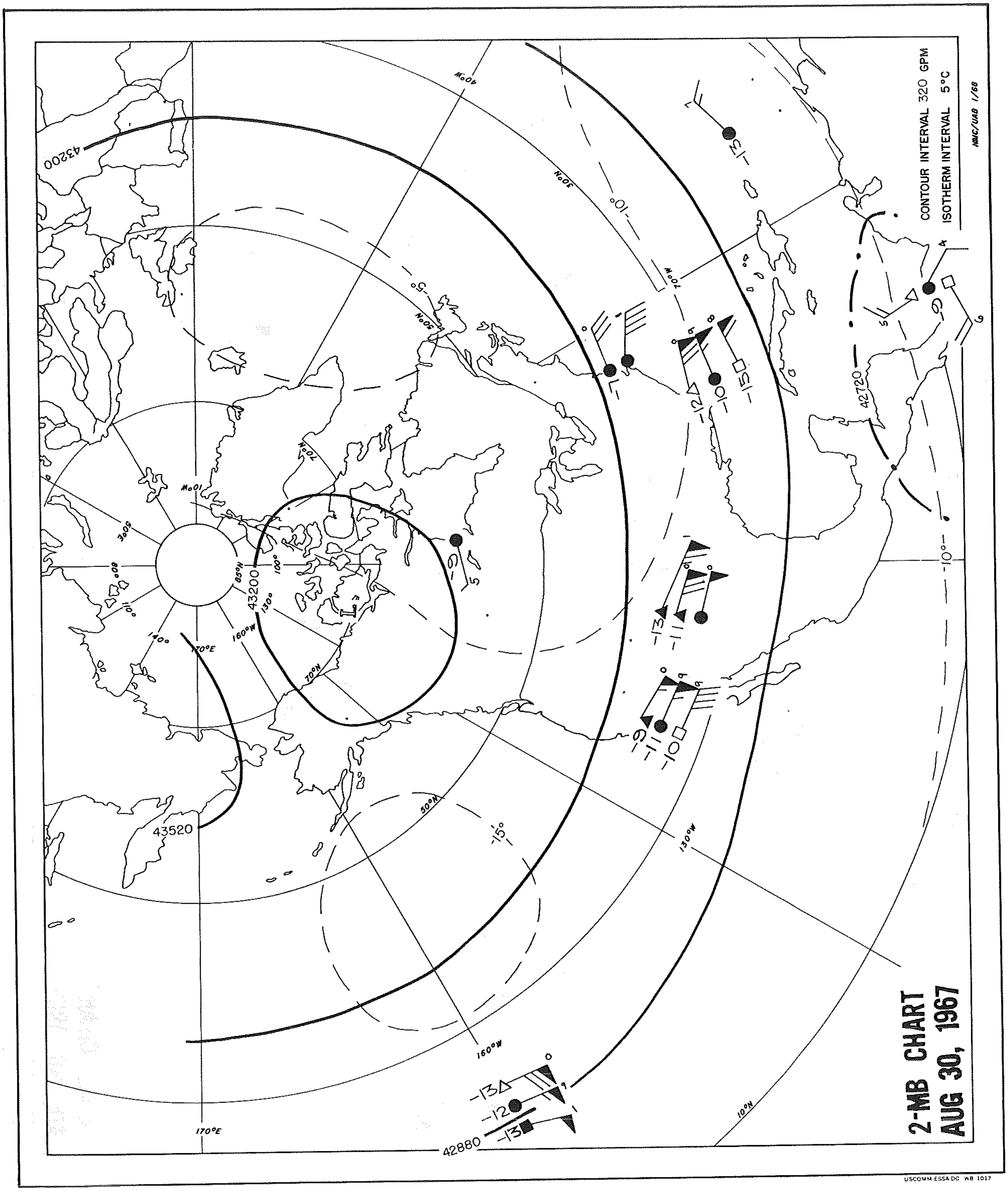
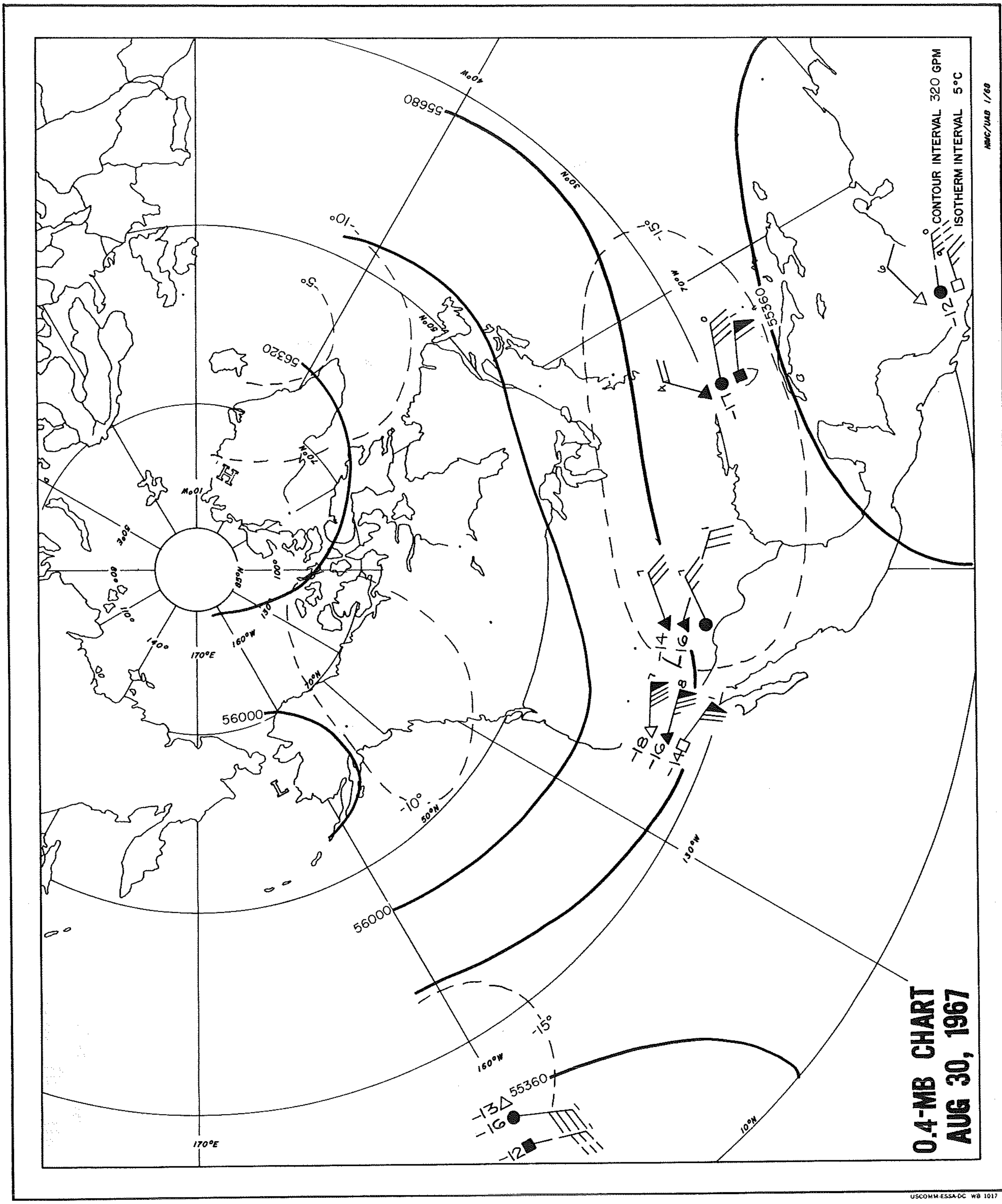
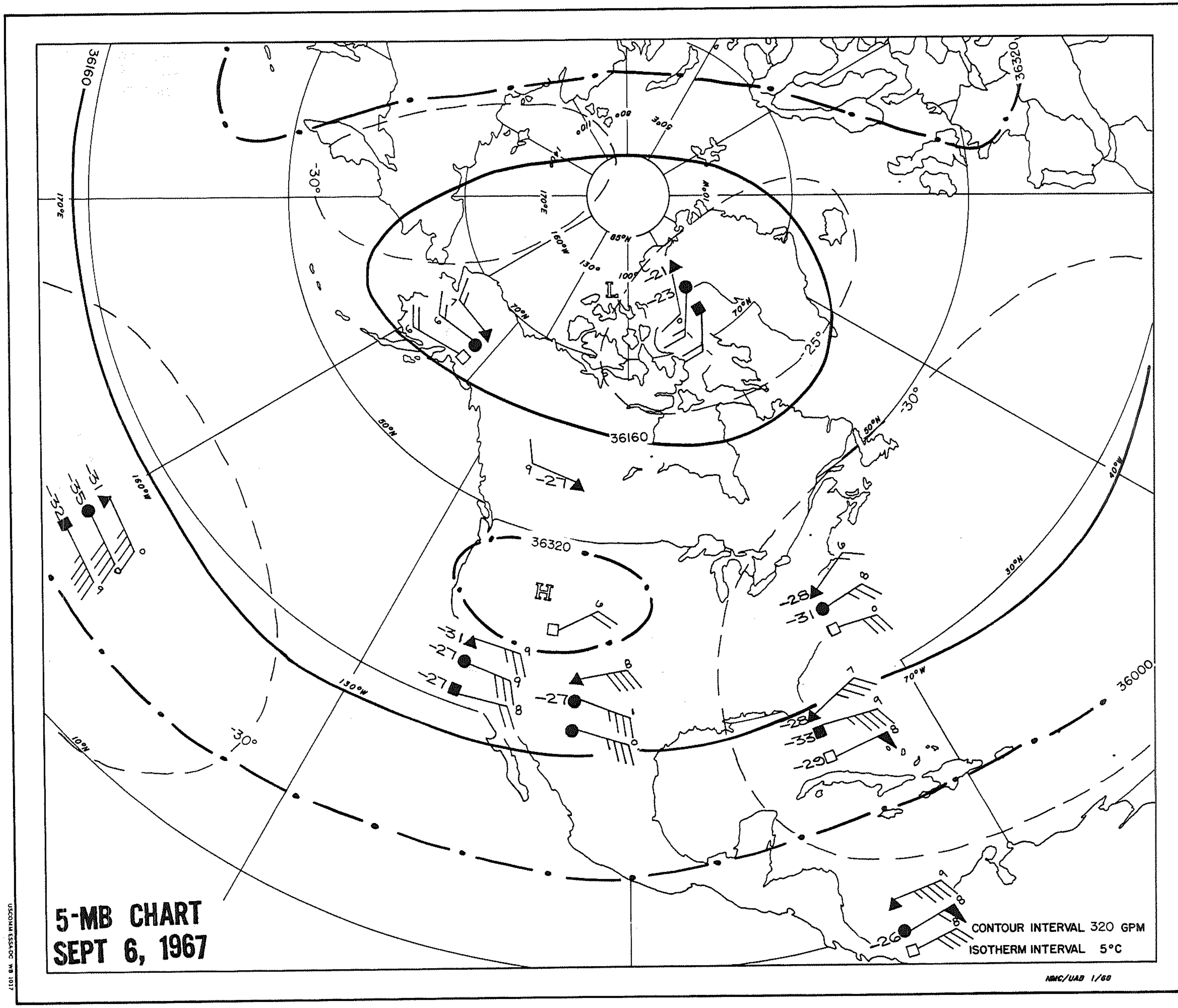

5-MB CHART
AUG 30, 1967
CONTOUR INTERVAL 320 GPM
ISOTHERM INTERVAL 5°C
NMC/UAB 1/68
36000
36160
36320
36480
USCOMM-ESSA-DC WB 1017

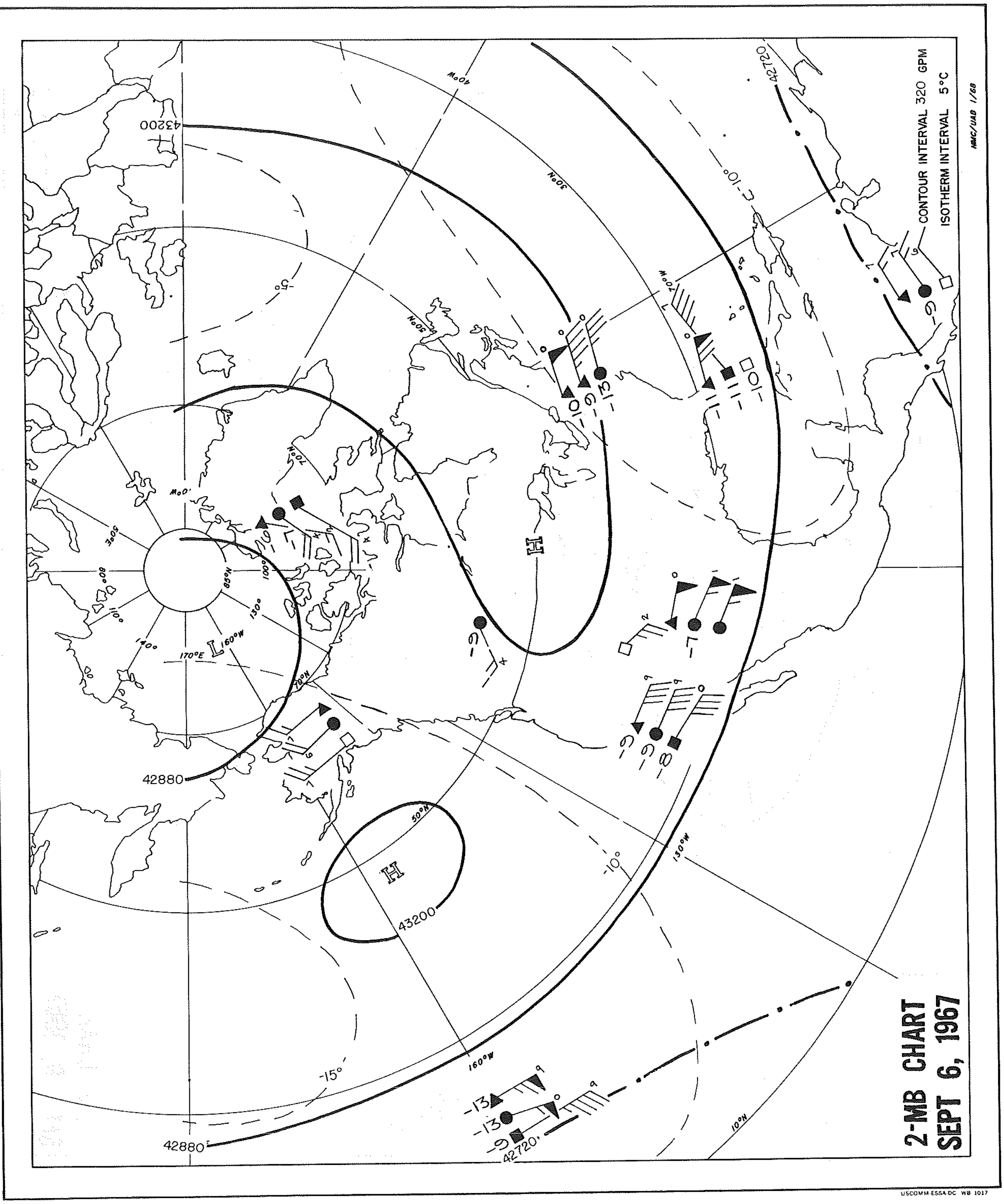


2-MB CHART
AUG 30, 1967
CONTOUR INTERVAL 320 GPM
ISOTHERM INTERVAL 5°C
NMC/UAB 1/68
43200
43520
42880
42720
USCOMM-ESSA-DC WB 1017

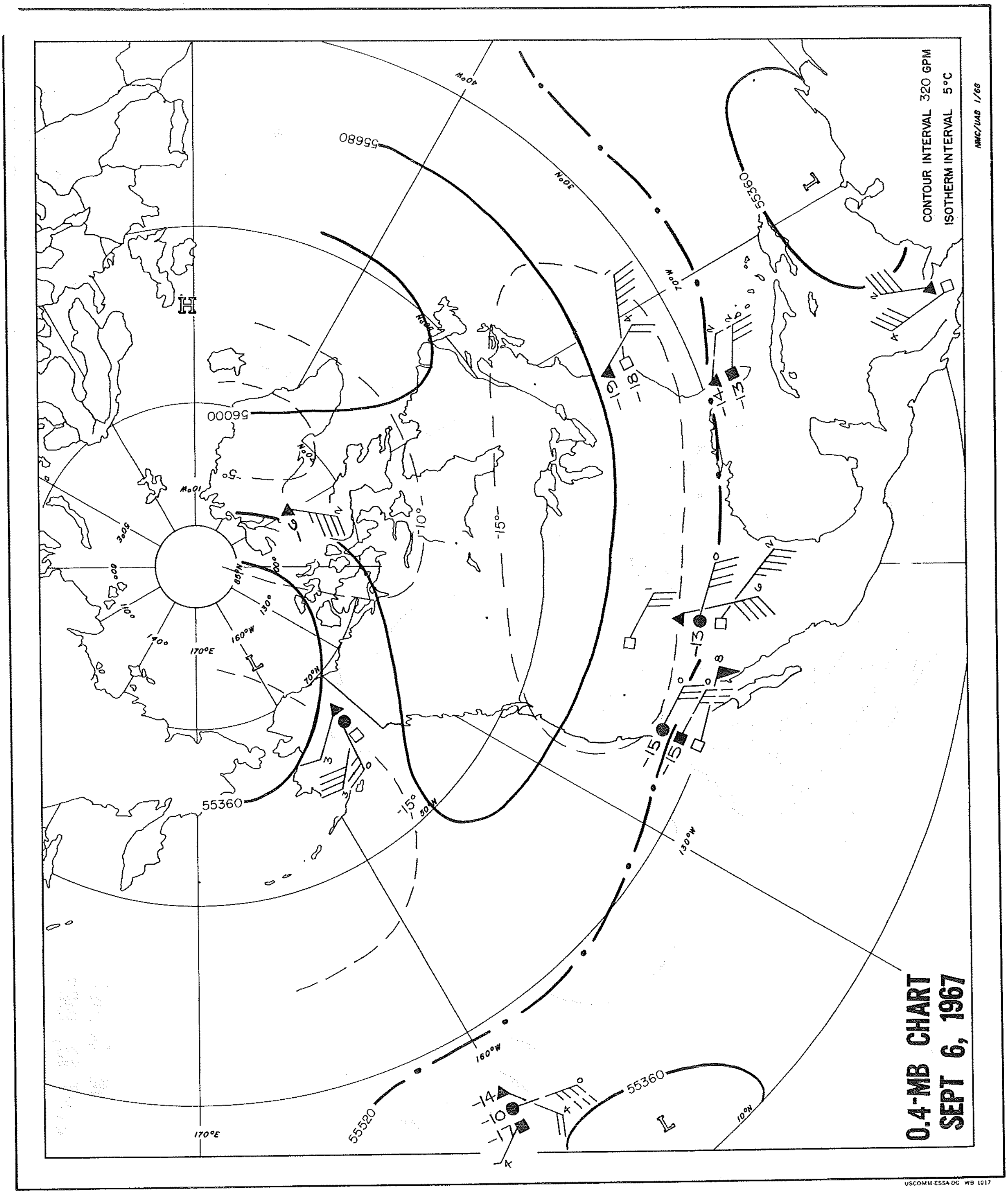

0.4-MB CHART
AUG 30, 1967
CONTOUR INTERVAL 320 GPM
ISOTHERM INTERVAL 5°C
NMC/UAB 1/68
55680
56320
56000
55360
-10°
-15°
-5°
H
L

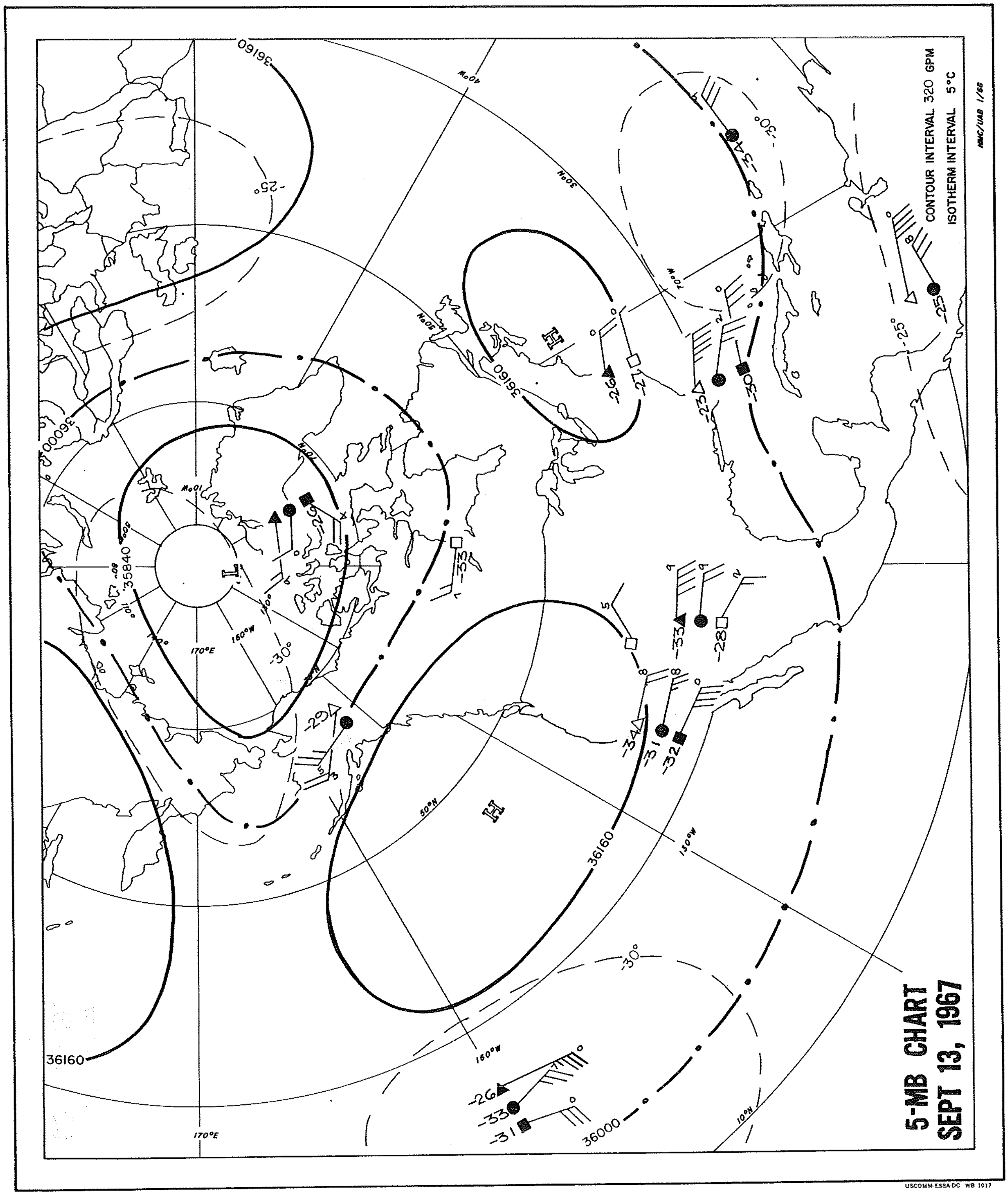


5-MB CHART
SEPT 6, 1967



USCOMM-ESSA-DC WB 1017


0.4-MB CHART
SEPT 6, 1967
CONTOUR INTERVAL 320 GPM
ISOTHERM INTERVAL 5°C
NMC/UAB 1/68
55680
56000
55360
55520
USCOMM-ESSA-DC WB 1017



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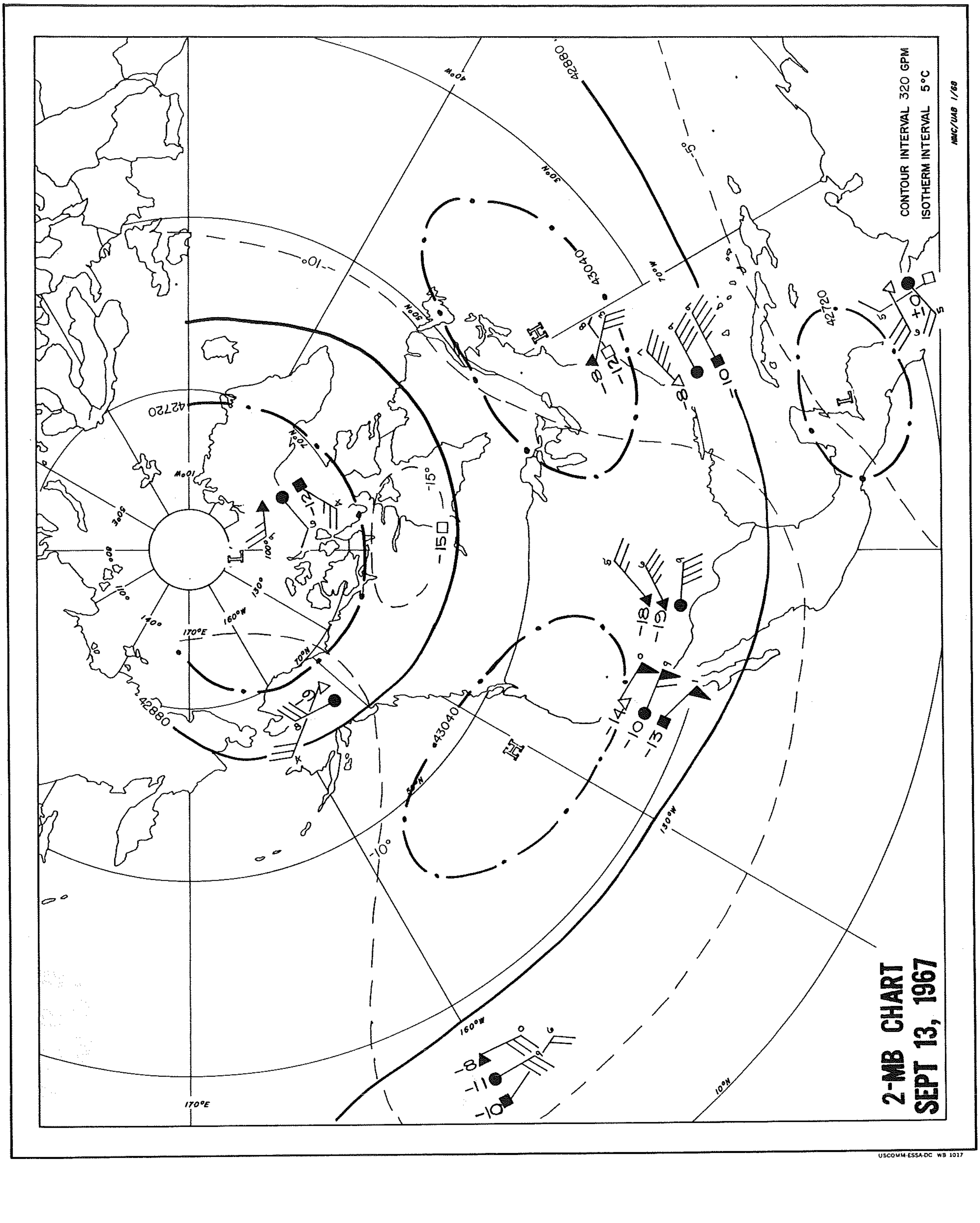
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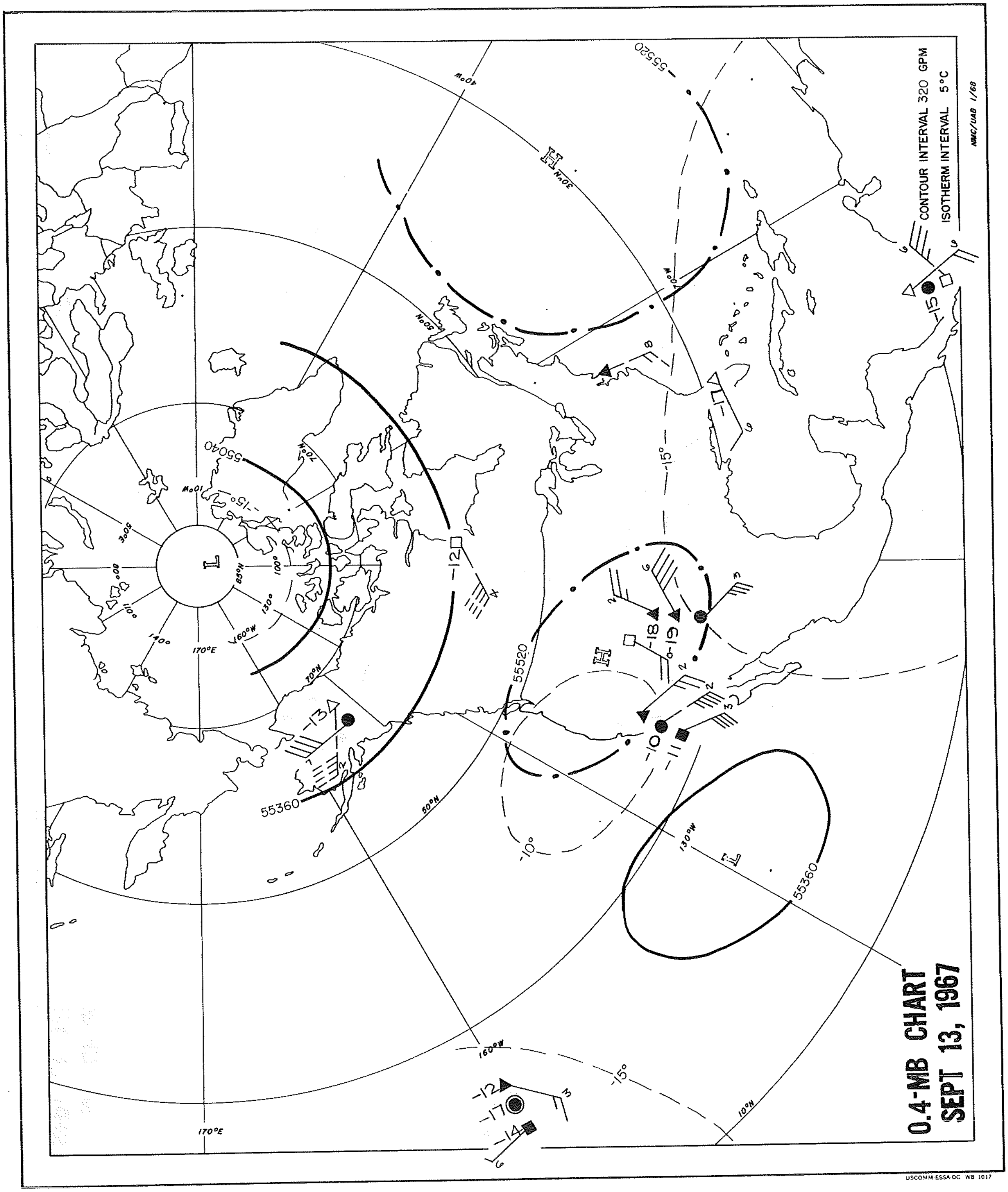
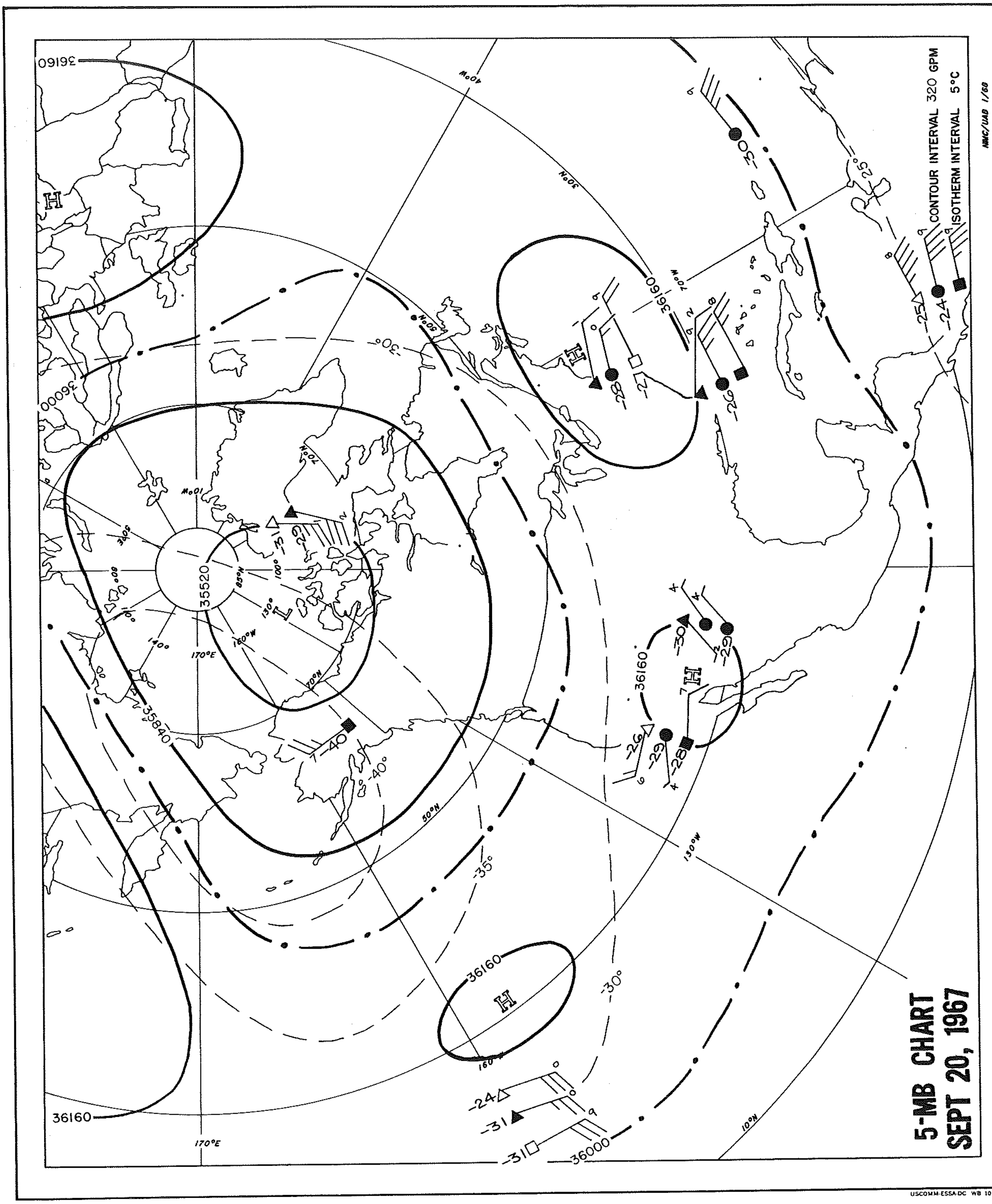
SEPT 13, 1967
CONTOUR INTERVAL 320 GPM
ISOTHERM INTERVAL 5°C
NMC/UAB 1/68
USCOMM-ESSA-DC WB 1017


0.4-MB CHART
SEPT 13, 1967
CONTOUR INTERVAL 320 GPM
ISOTHERM INTERVAL 5°C
NMC/UAB 1/68
55520
55040
55360
H
L
USCOMM-ESSA-DC WB 1017



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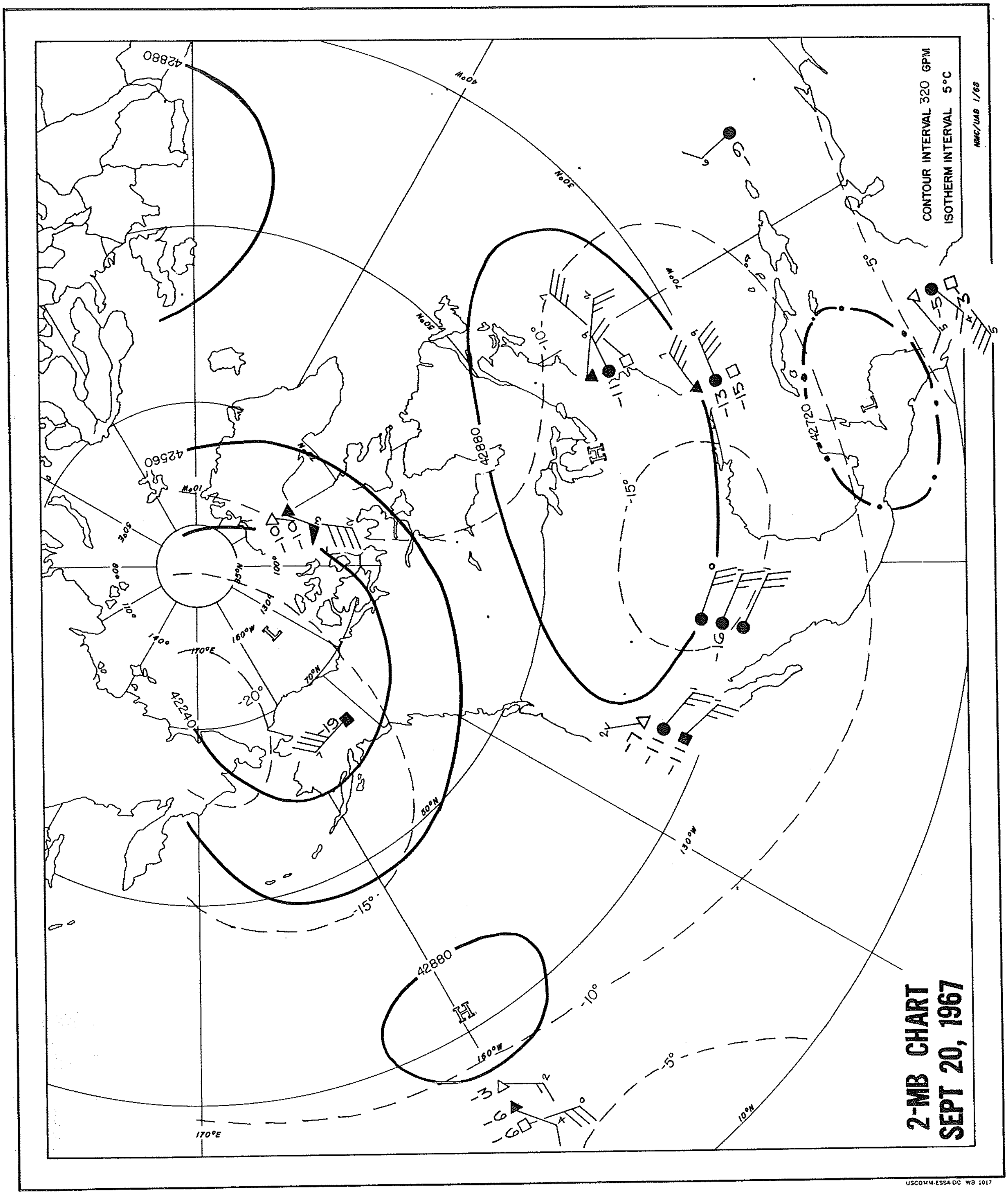
2-MB CHART
SEPT 20, 1967
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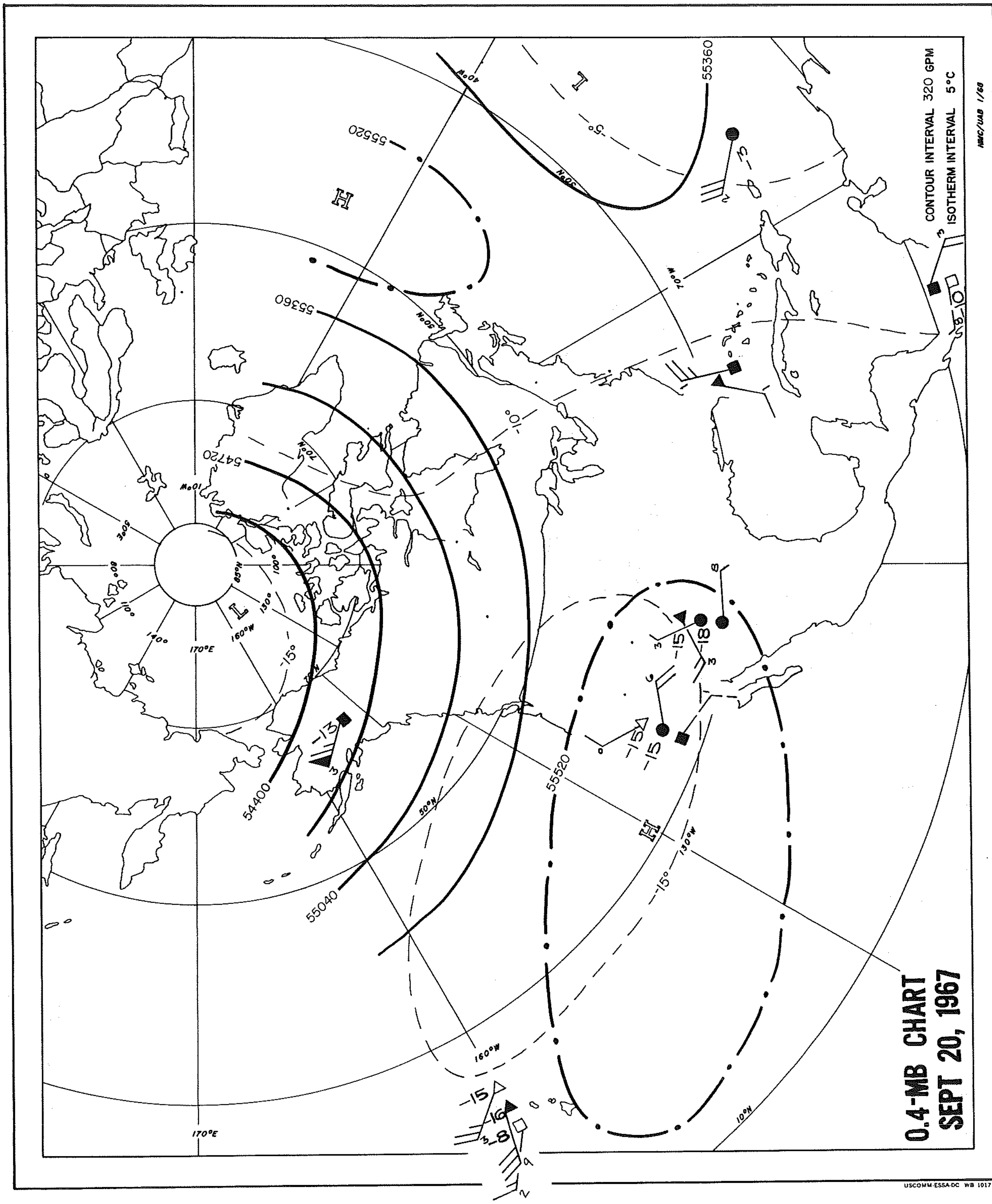
ISOTHERM INTERVAL 5°C
USCOMM-ESSA-DC WB 1017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SEPT 20, 1967
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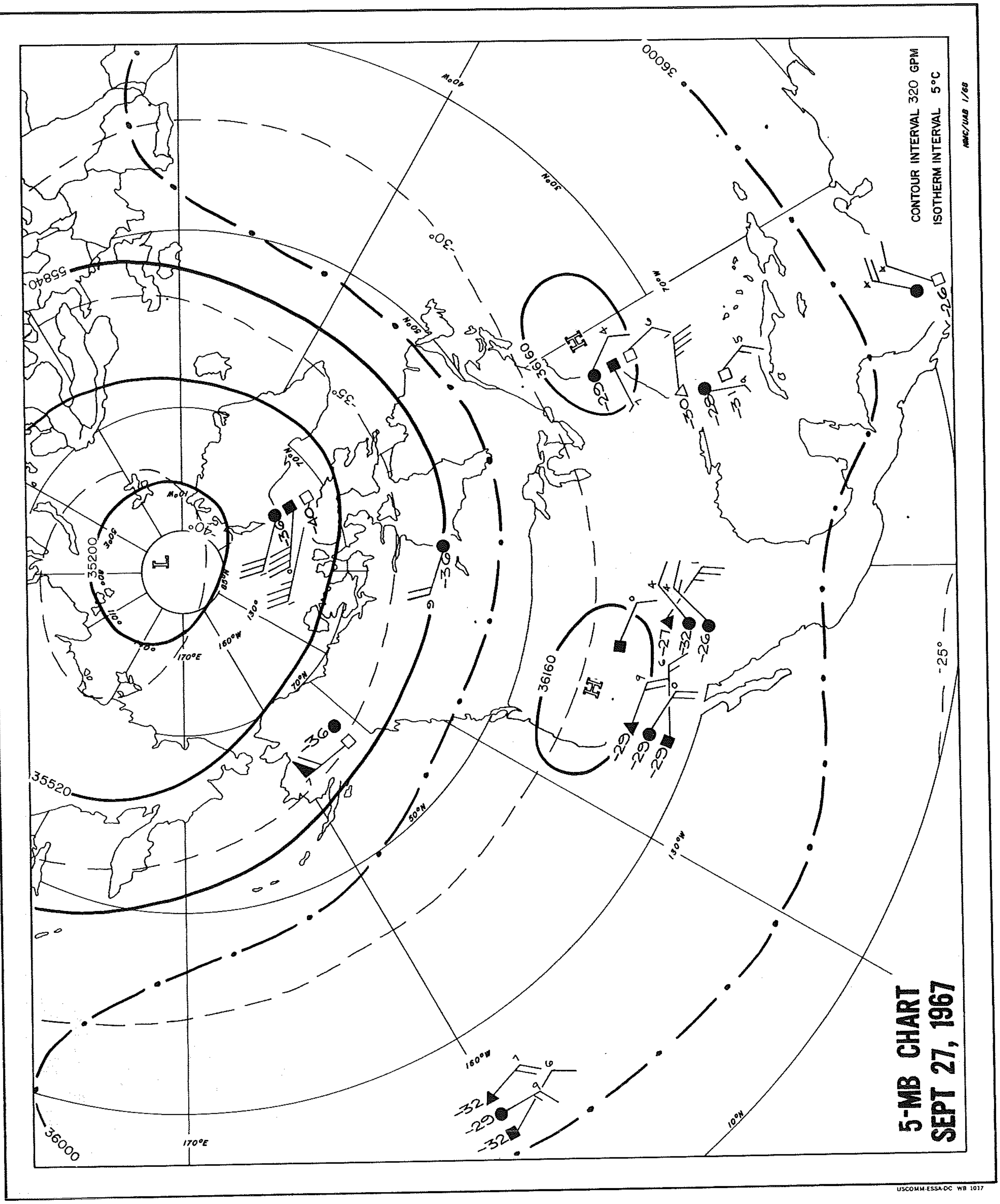
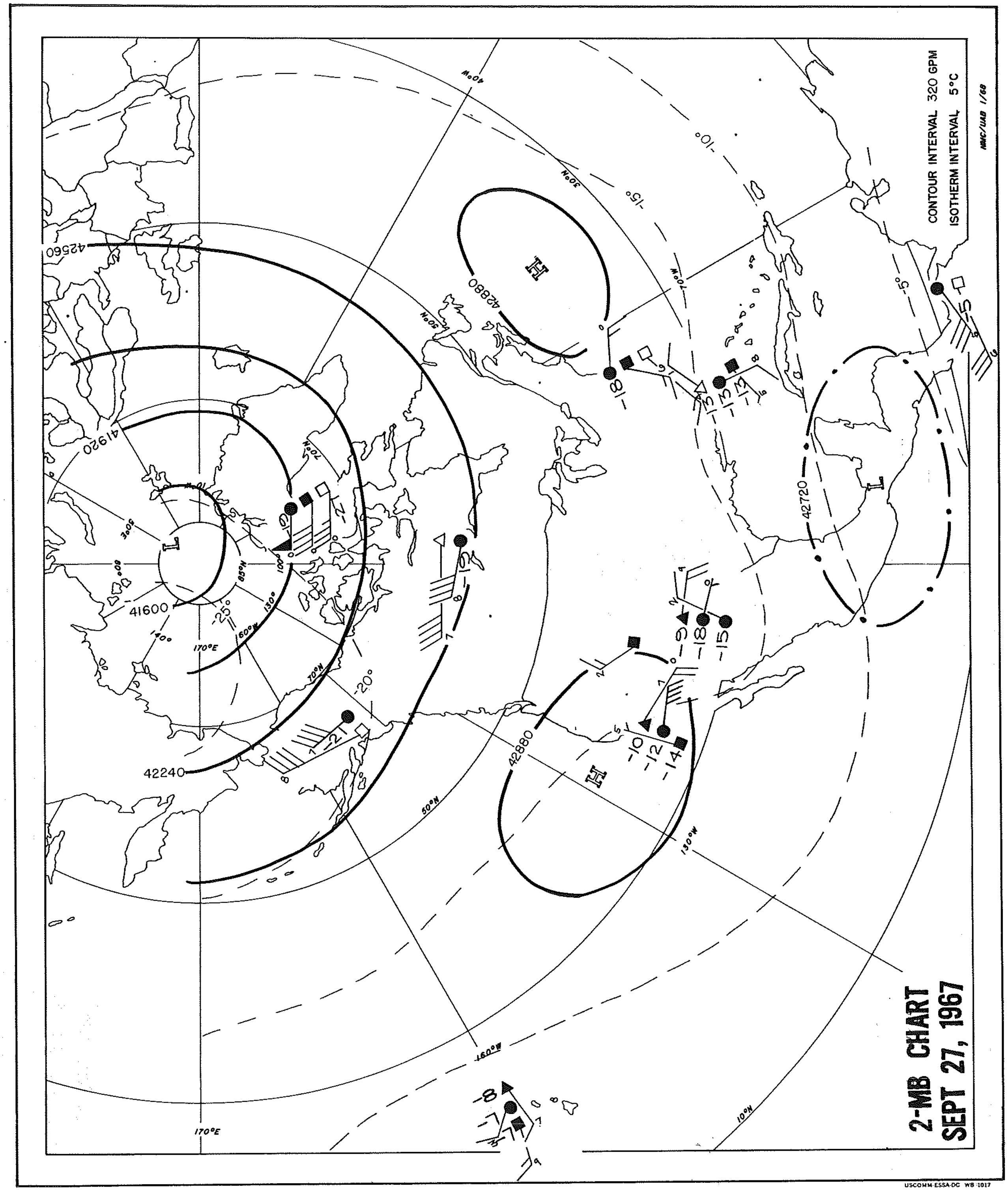
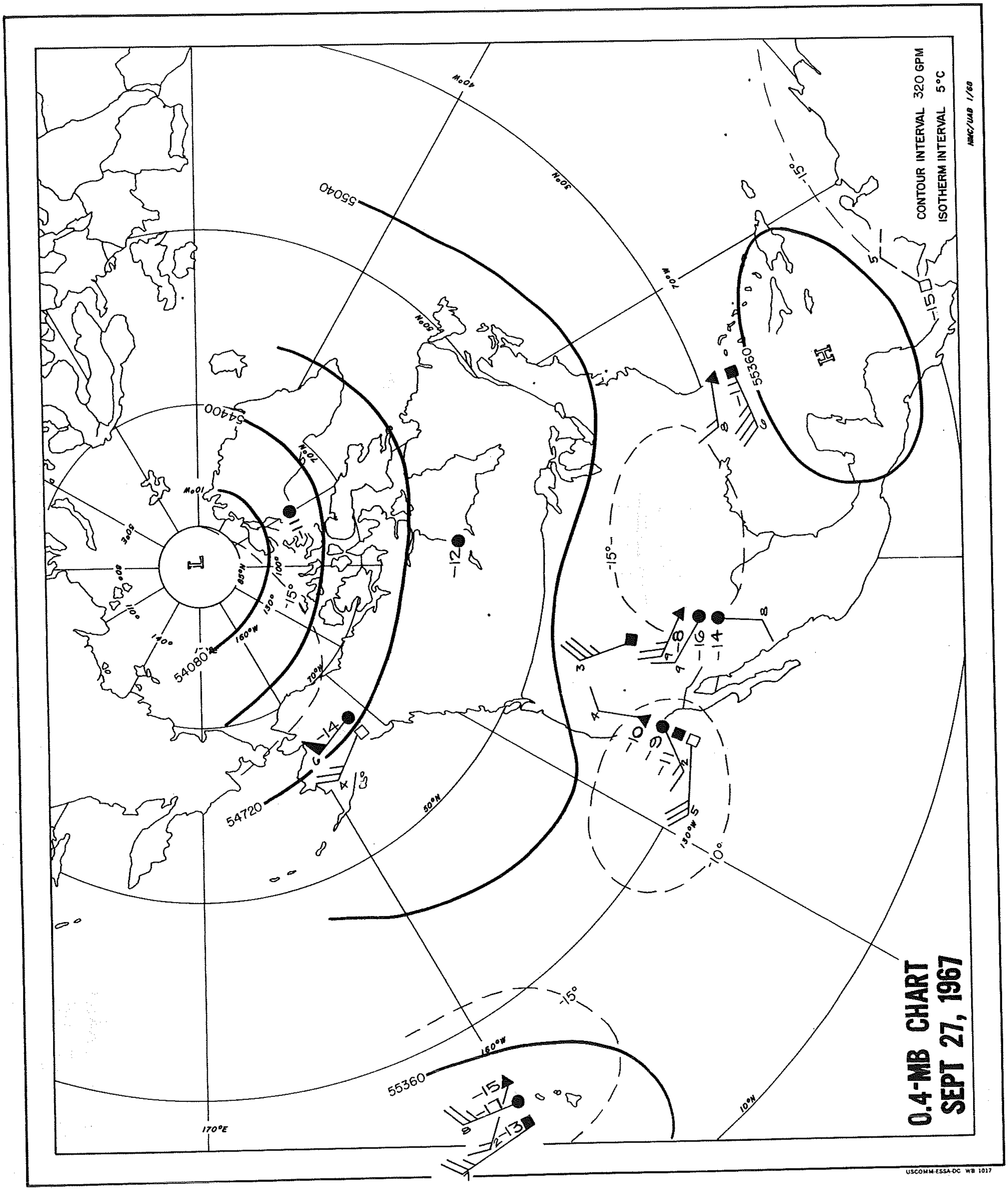
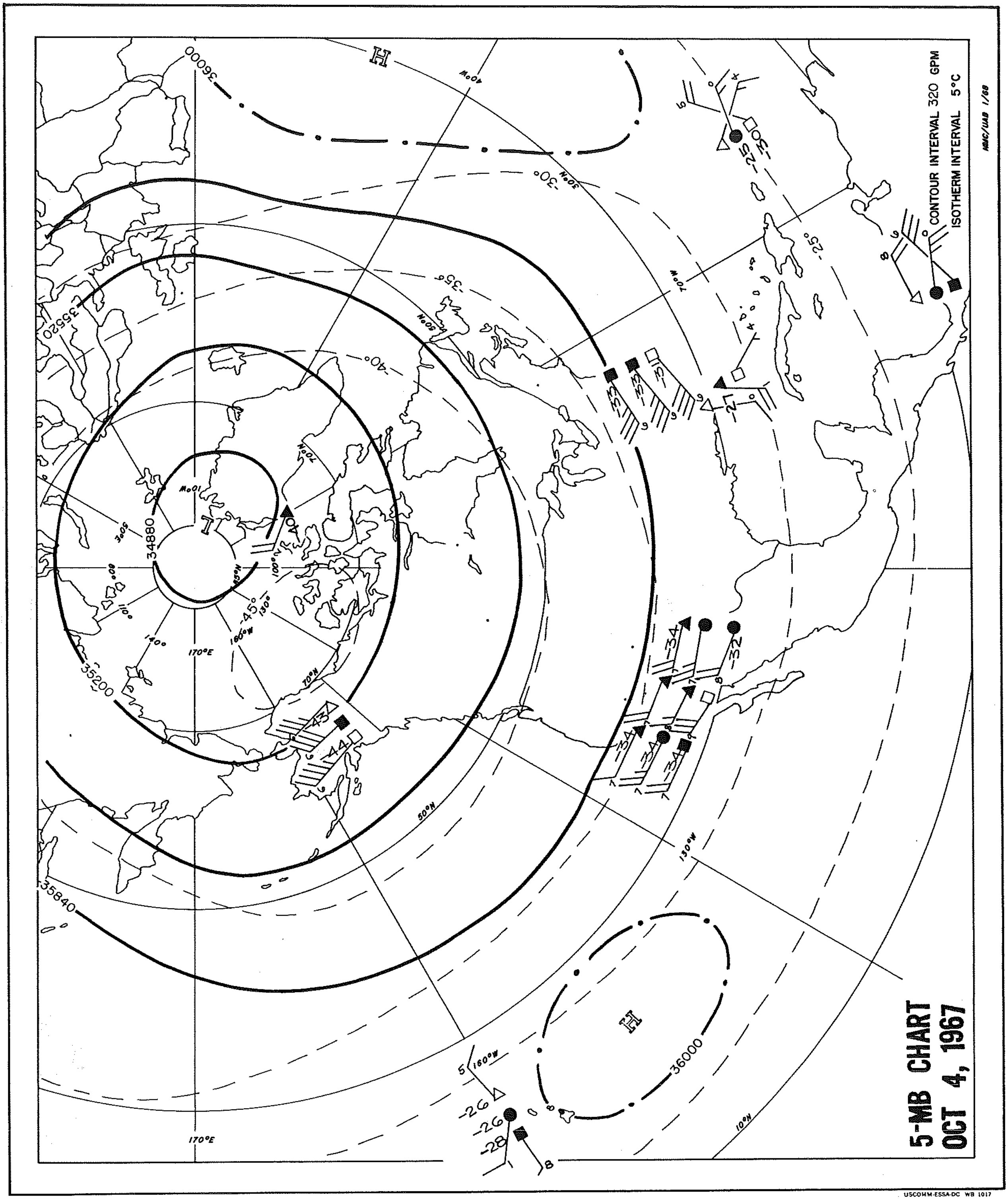
NMC/UAB 1/68
55360
55520
55040
54720
54400
USCOMM-ESSA-DC WB 1017

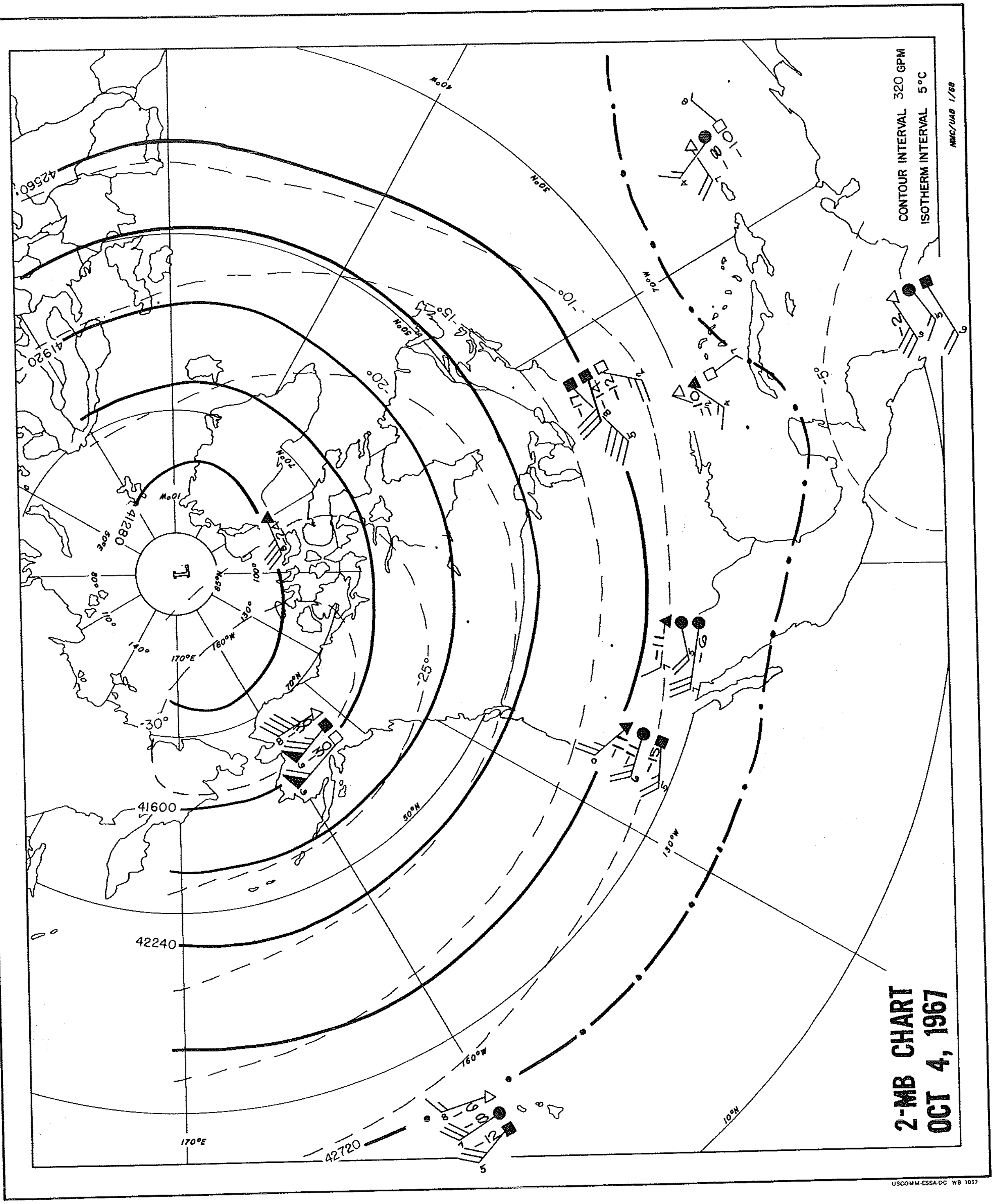


5-MB CHART
SEPT 27, 1967
CONTOUR INTERVAL 320 GPM
ISOTHERM INTERVAL 5°C
USCOMM-ESSA-DC WB 1017
36000
35840
35520
35200
36160
H
L
-30°
-35°
-40°
-25°


2-MB CHART
SEPT 27, 1967
CONTOUR INTERVAL 320 GPM
ISOTHERM INTERVAL 5°C
42560
41920
41600
42240
42880
42720
USCOMM-ESSA-DC WB 1017


0.4-MB CHART
SEPT 27, 1967
CONTOUR INTERVAL 320 GPM
ISOTHERM INTERVAL 5°C
NMC/UAD 1/68
55040
54400
54080
54720
55360
55360
USCOMM-ESSA-DC WB 1017


5-MB CHART
OCT 4, 1967
CONTOUR INTERVAL 320 GPM
ISOTHERM INTERVAL 5°C
36000
35840
35520
35200
34880
H
L
USCOMM-ESSA-DC WB 1017



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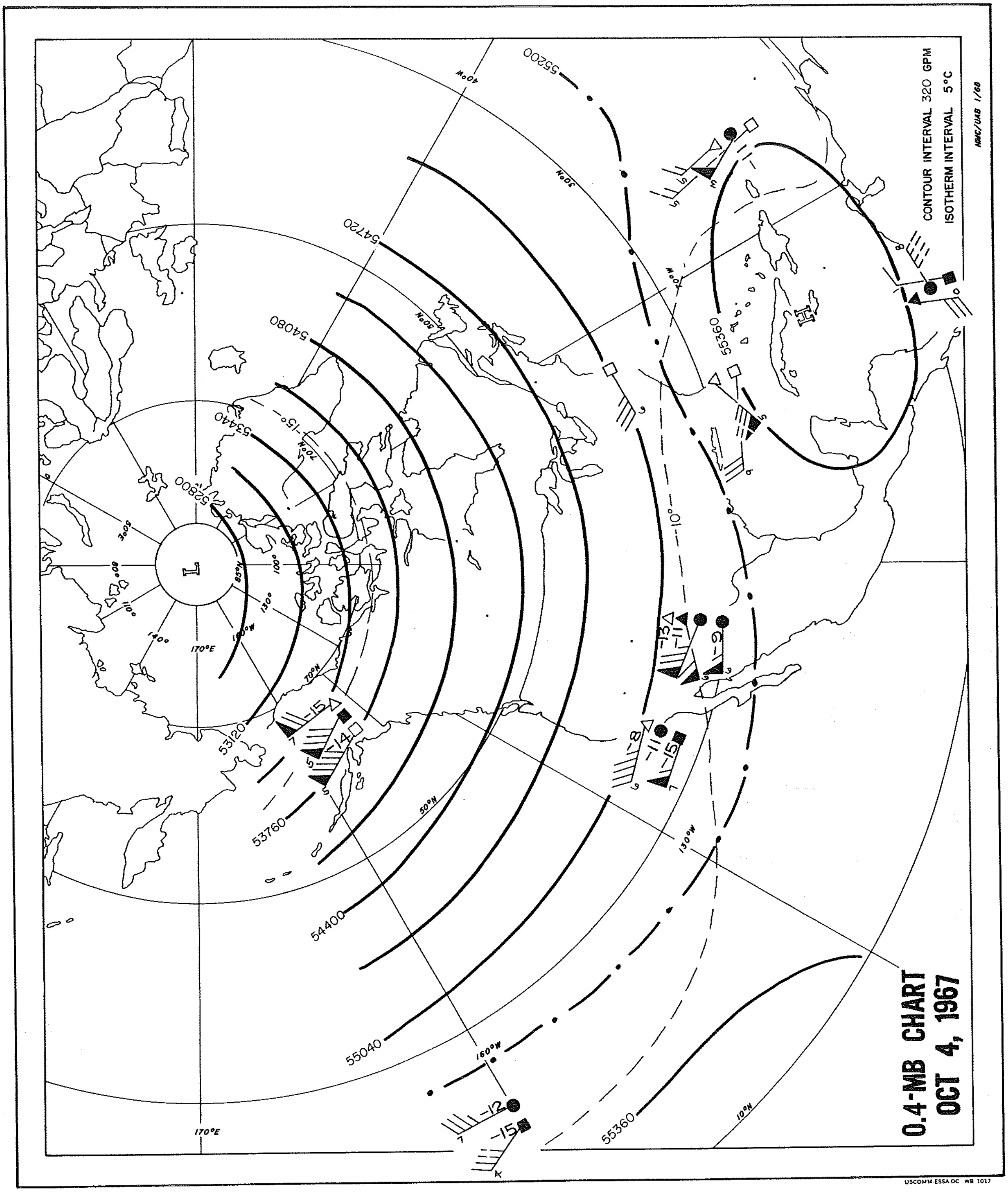
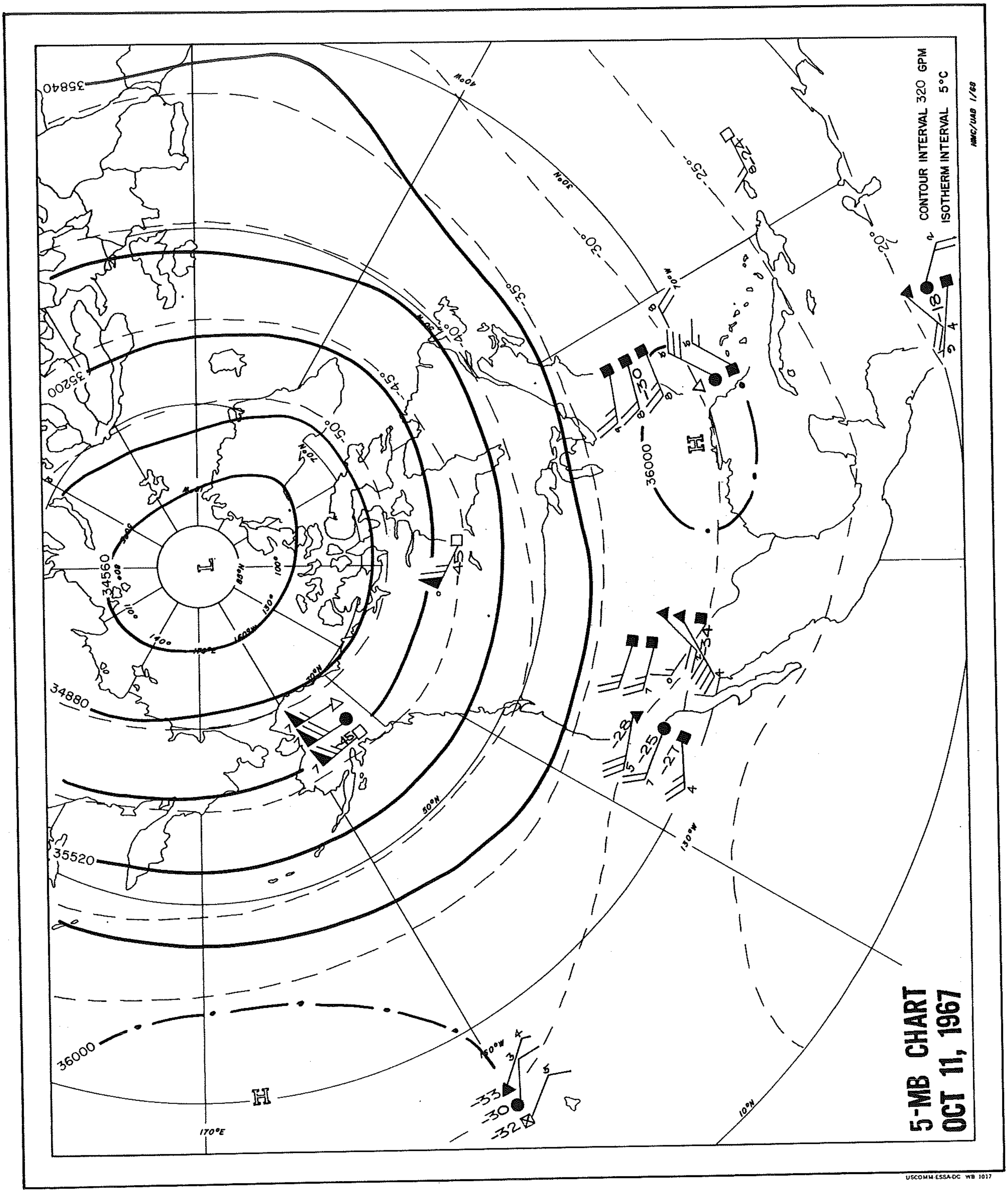
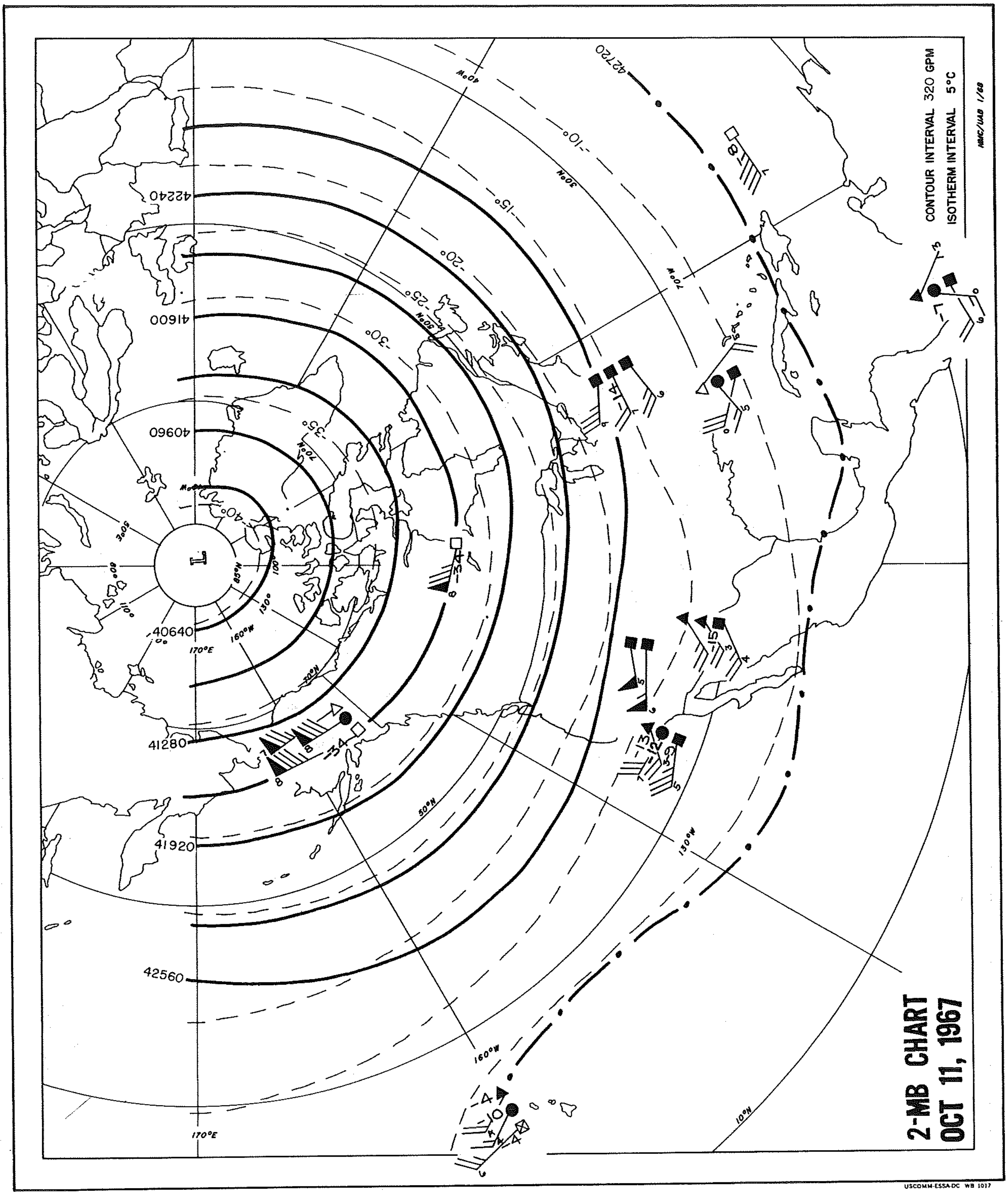
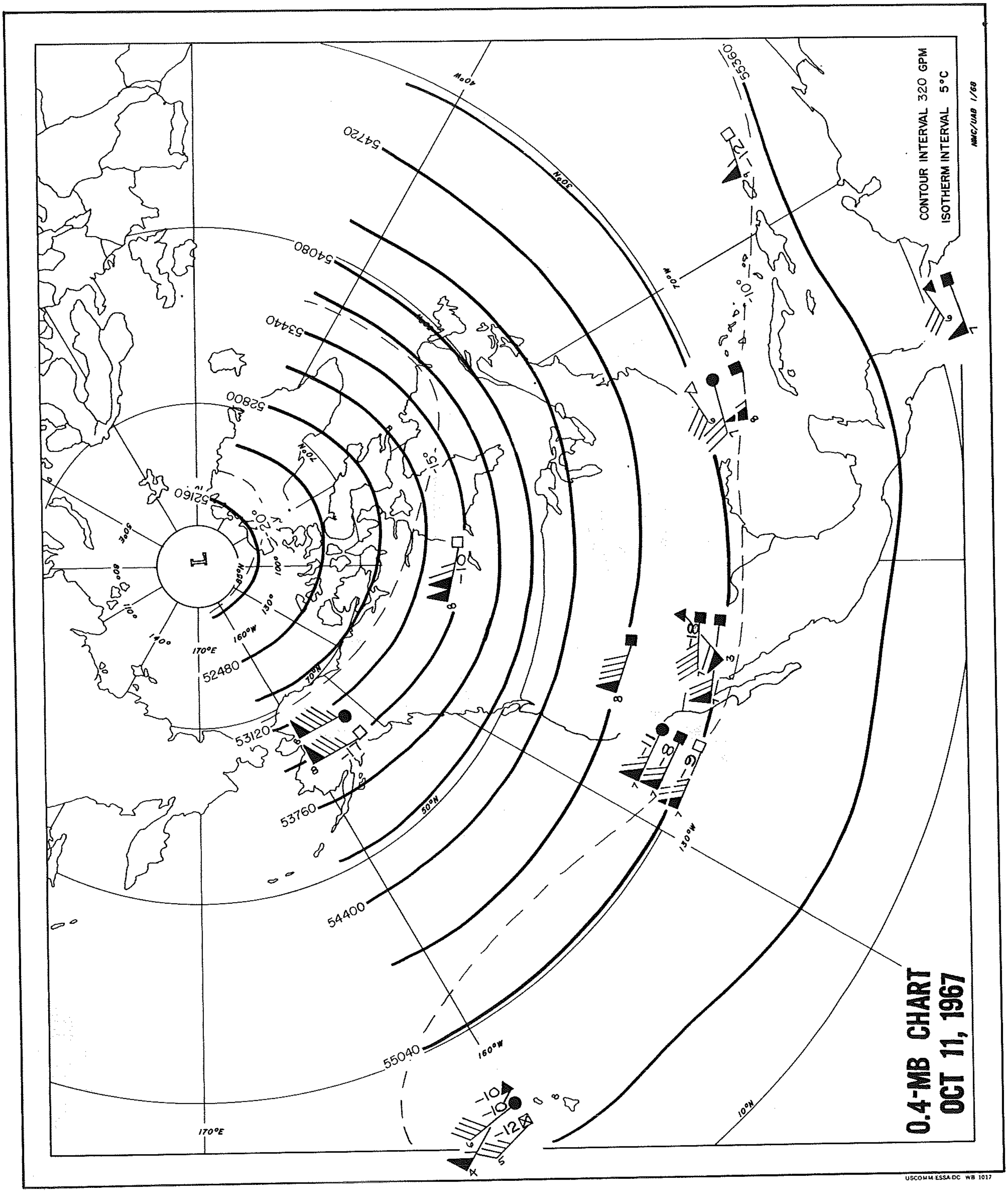
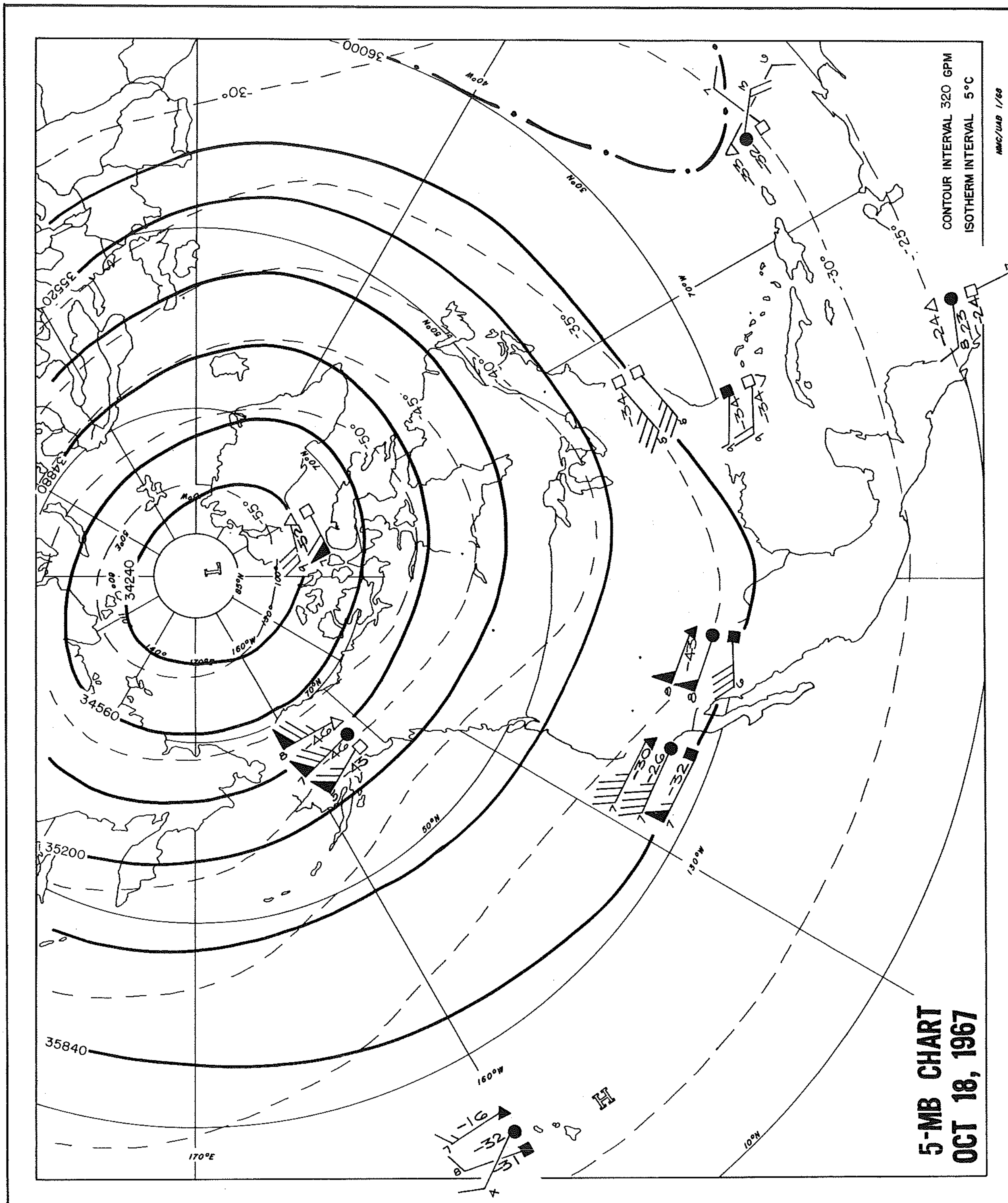

0.4-MB CHART
OCT 4, 1967
CONTOUR INTERVAL 320 GPM
ISOTHERM INTERVAL 5°C
NMC/UAB 1/68
52800
53120
53440
53760
54080
54400
54720
55040
55200
55360
55360
USCOMM-ESSA-DC WB 1017


5-MB CHART
OCT 11, 1967
CONTOUR INTERVAL 320 GPM
ISOTHERM INTERVAL 5°C
35840
35200
34560
34880
35520
36000
36000
USCOMM-ESSA-DC WB 1017


2-MB CHART
OCT 11, 1967
CONTOUR INTERVAL 320 GPM
ISOTHERM INTERVAL 5°C
NMC/UAB 1/68
USCOMM-ESSA-DC WB 1017
L
40640
40960
41280
41600
41920
42240
42560
42720


0.4-MB CHART
OCT 11, 1967
CONTOUR INTERVAL 320 GPM
ISOTHERM INTERVAL 5°C
52160
52480
52800
53120
53440
53760
54080
54400
54720
55040
55360
USCOMM-ESSA-DC WB 1017



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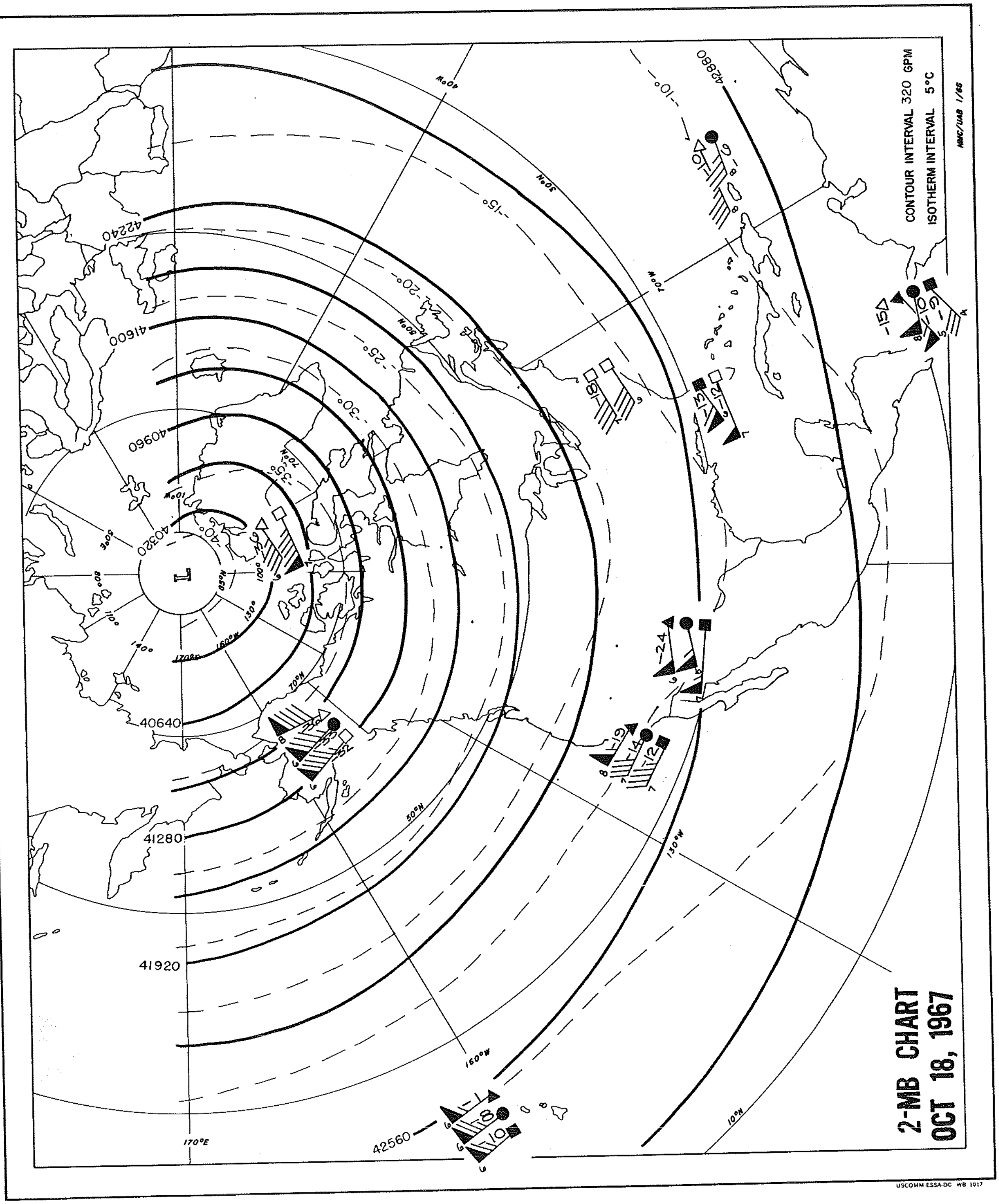
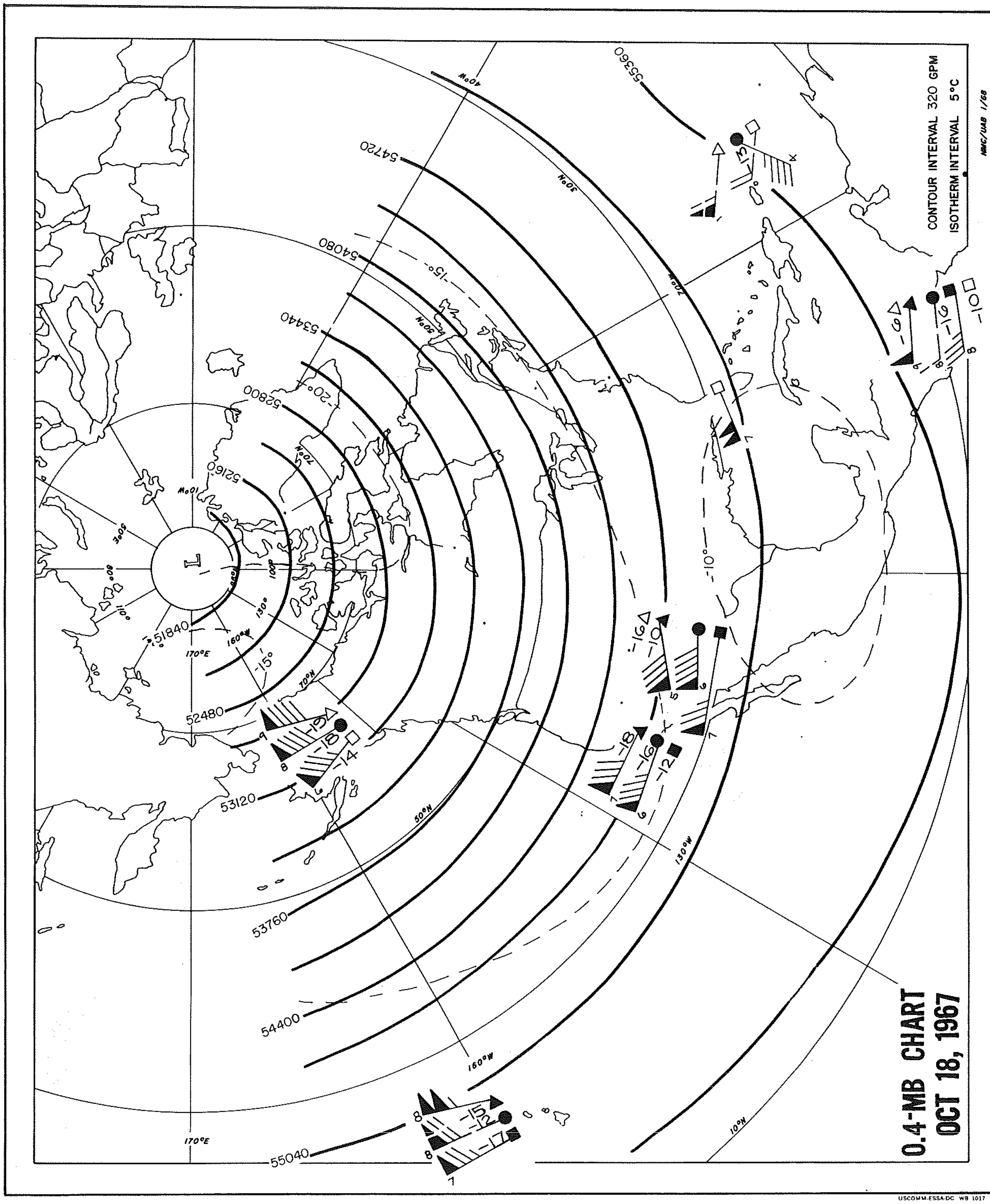

2-MB CHART
OCT 18, 1967
CONTOUR INTERVAL 320 GPM
ISOTHERM INTERVAL 5°C
42240
41600
40960
40320
40640
41280
41920
42560
42880
-10°
-15°
-20°
-25°
-30°
-35°
-40°
30°N
50°N
70°N
10°N
40°W
70°W
100°W
130°W
160°W
170°E
USCOMM-ESSA-DC WB 1017



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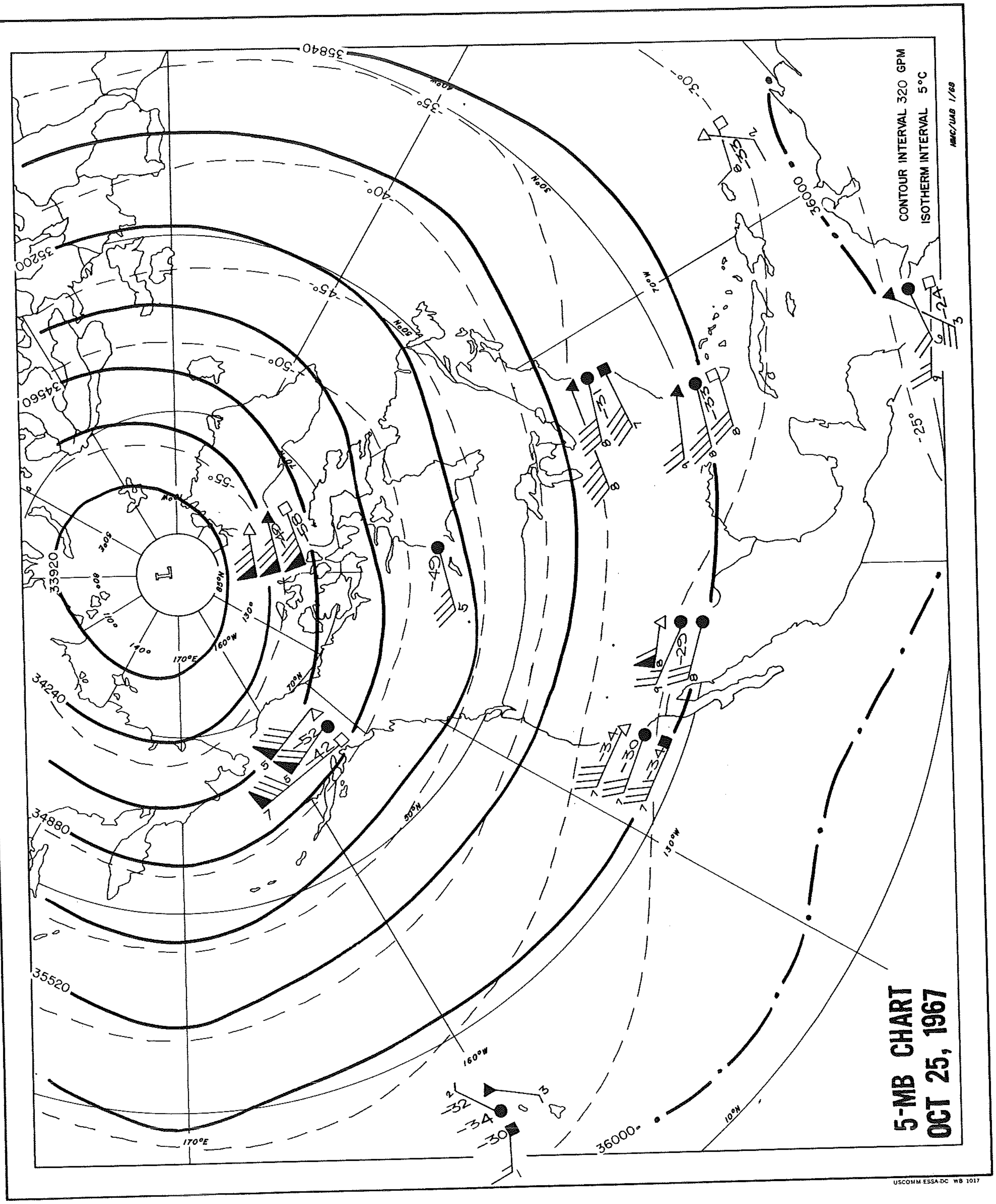
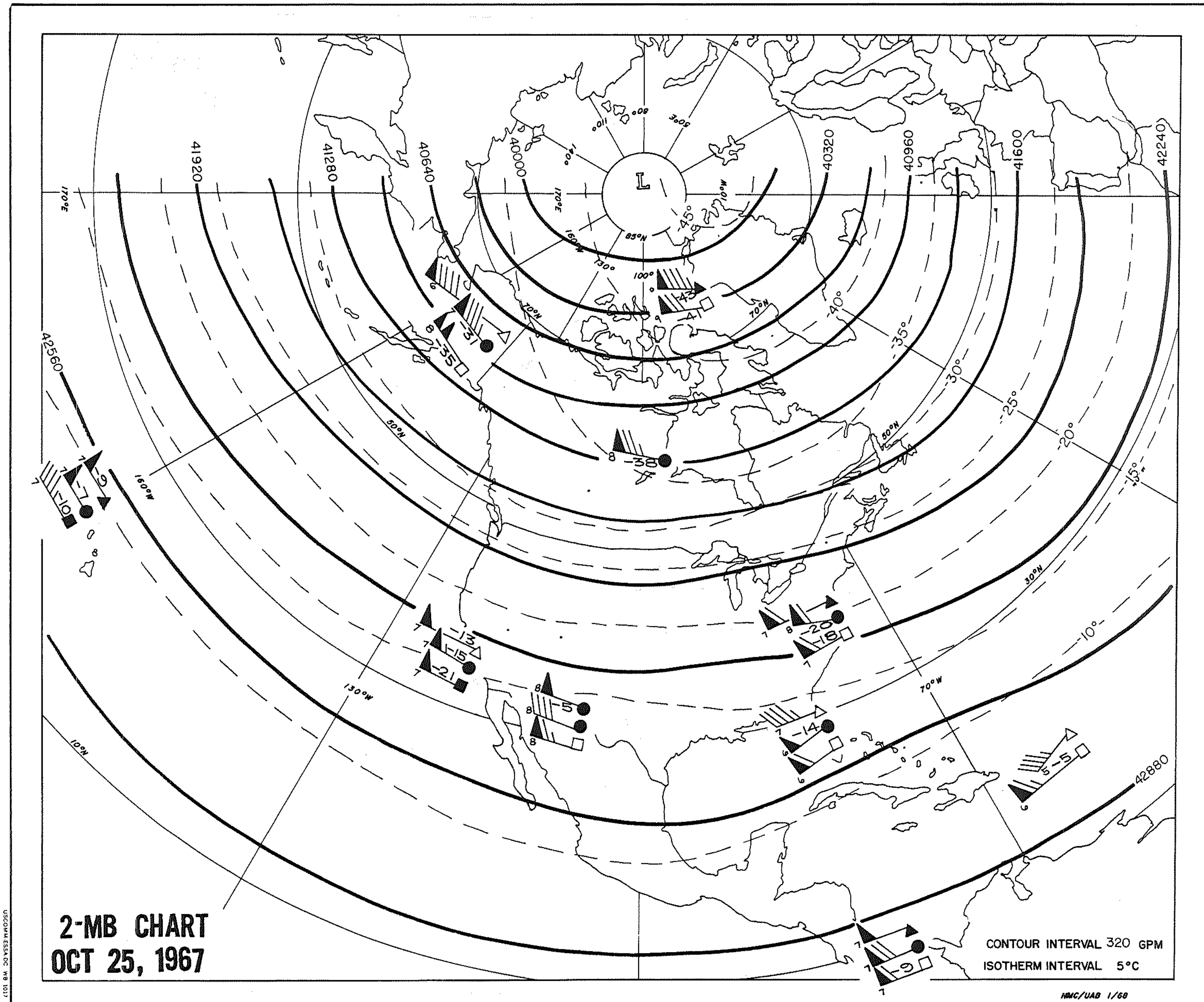
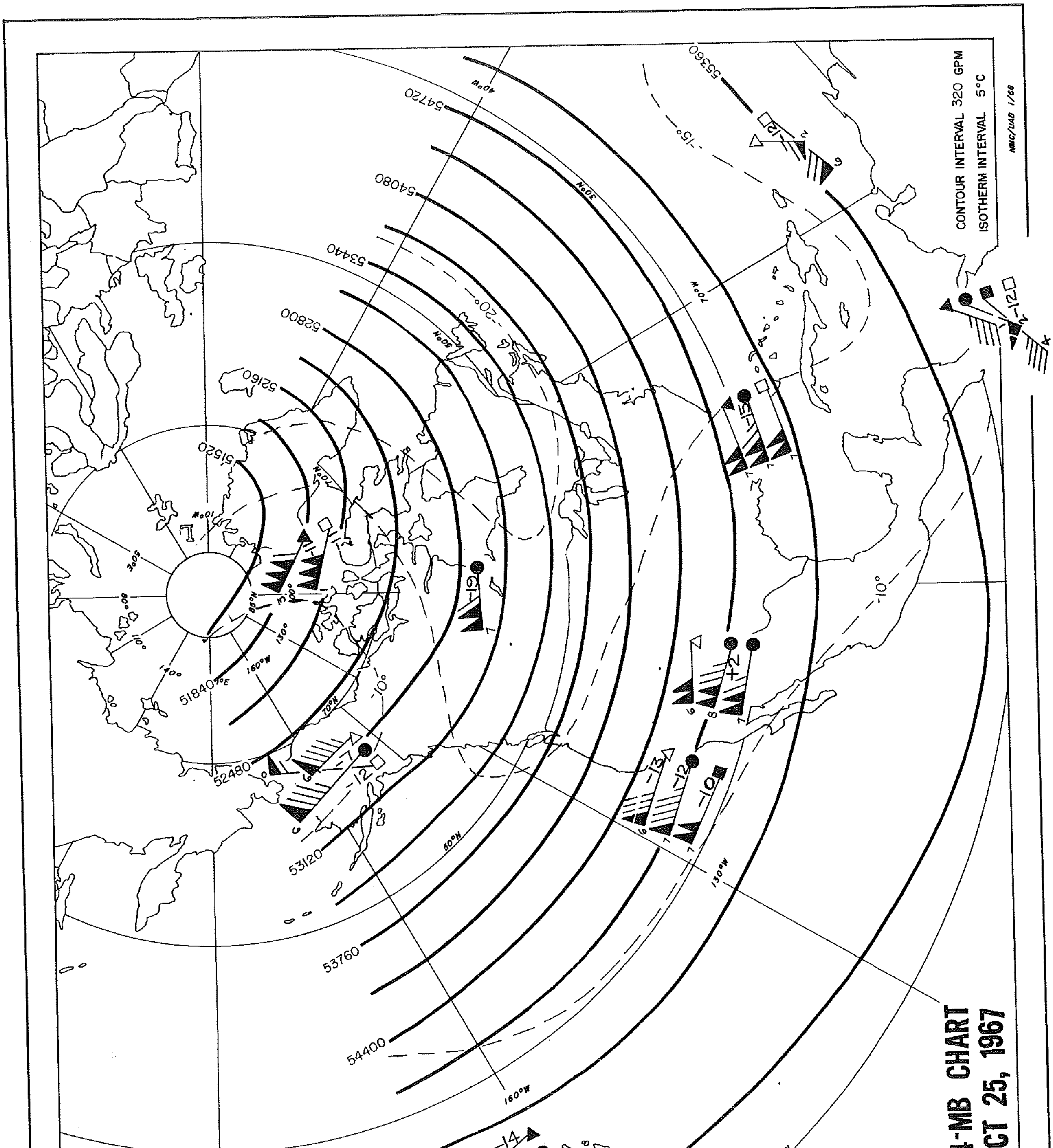

5-MB CHART
OCT 25, 1967
CONTOUR INTERVAL 320 GPM
ISOTHERM INTERVAL 5°C
NMC/UAB 1/68
USCOMM-ESSA-DC WB 1017
35840
35200
34560
33920
34240
34880
35520
36000
L


2-MB CHART
OCT 25, 1967
CONTOUR INTERVAL 320 GPM
ISOTHERM INTERVAL 5°C
NMC/UAB 1/68
USCOMM-ESSA-DC WB 1017
L
42560
41920
41280
40640
40000
40320
40960
41600
42240
42880
-45°
-40°
-35°
-30°
-25°
-20°
-15°
-10°
85°N
70°N
50°N
30°N
10°N
160°W
130°W
100°
70°W
170°E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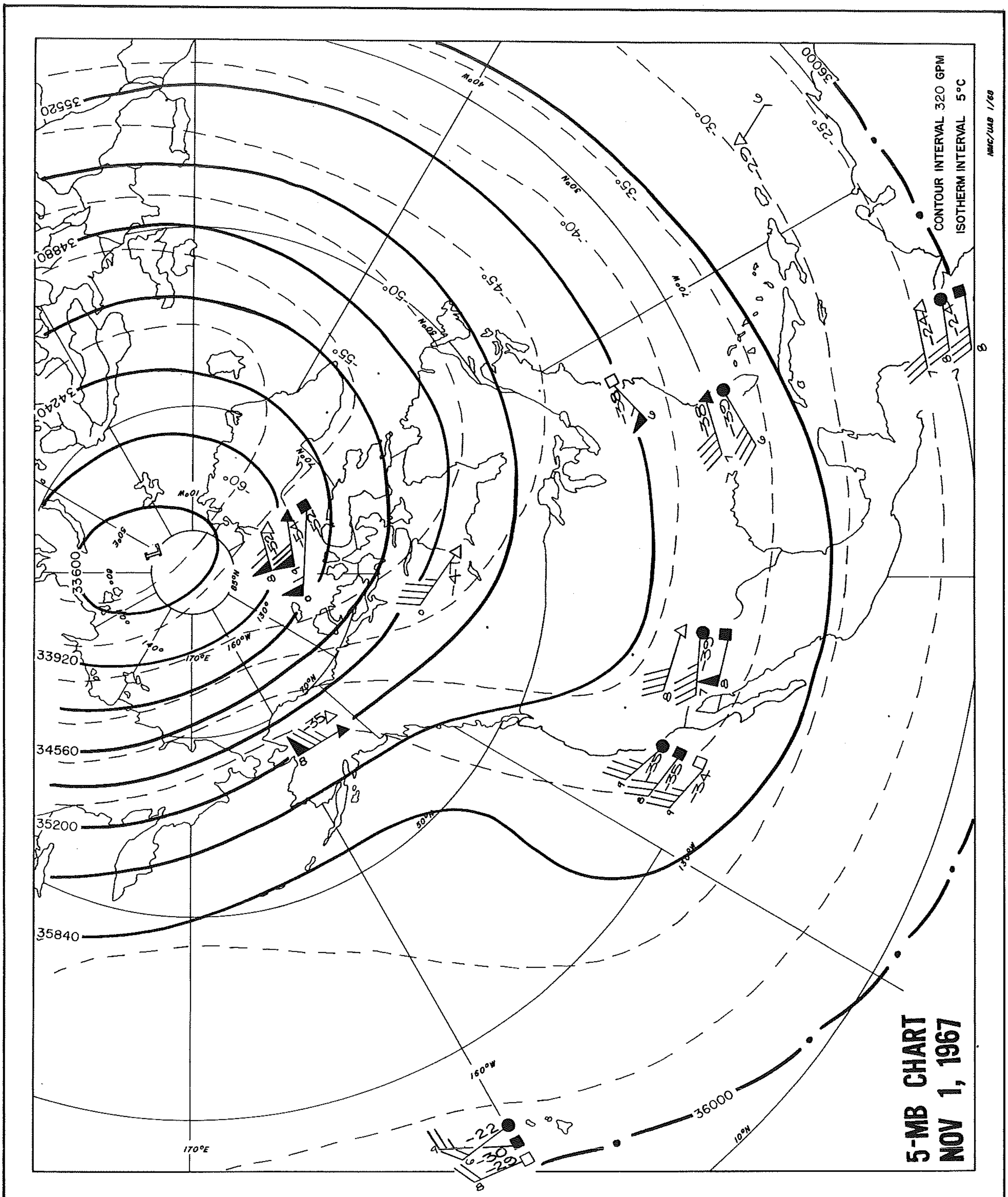
ISOTHERM INTERVAL 5°C
NMC/UAB 1/68
USCOMM-ESSA-DC WB 1017



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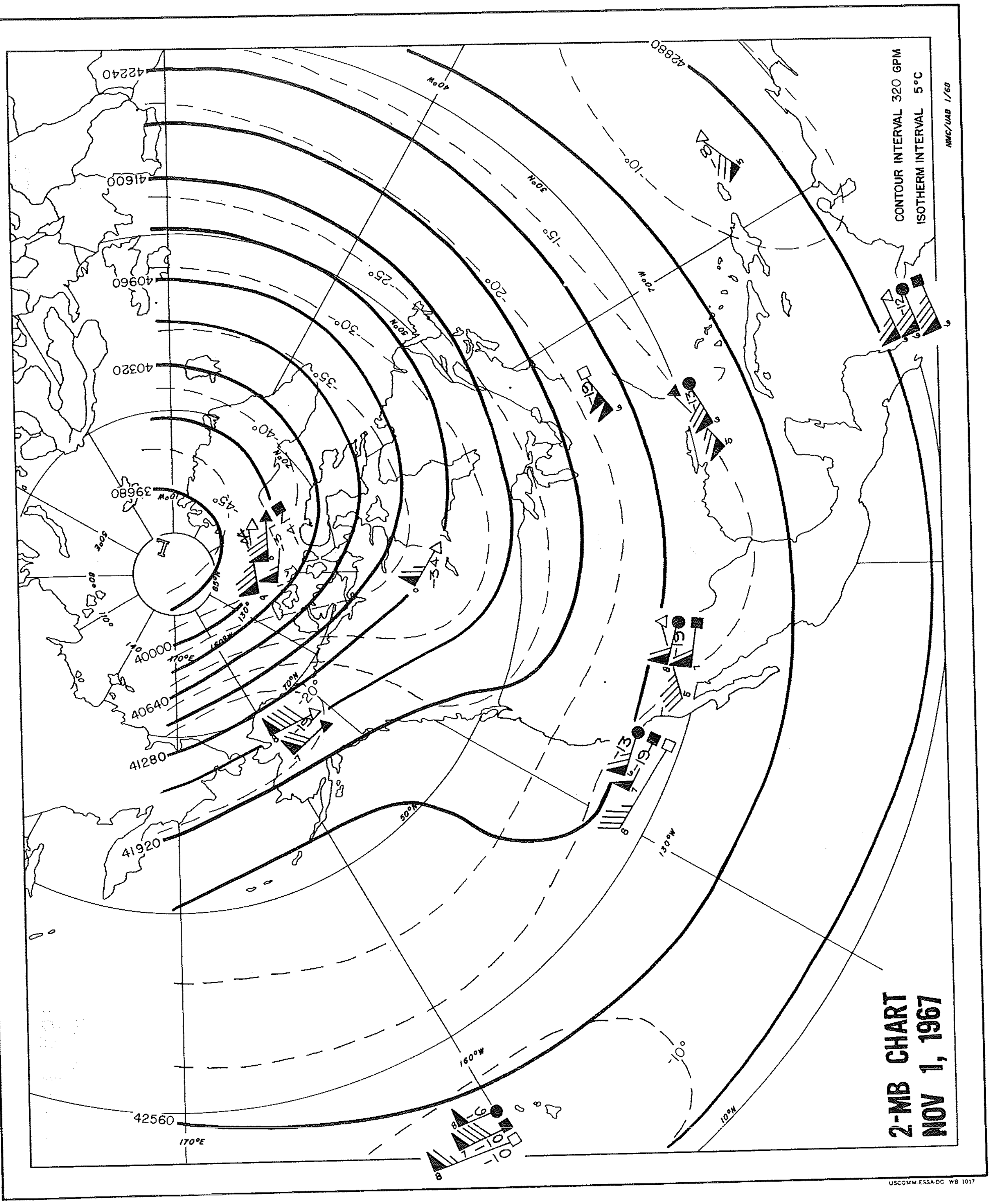
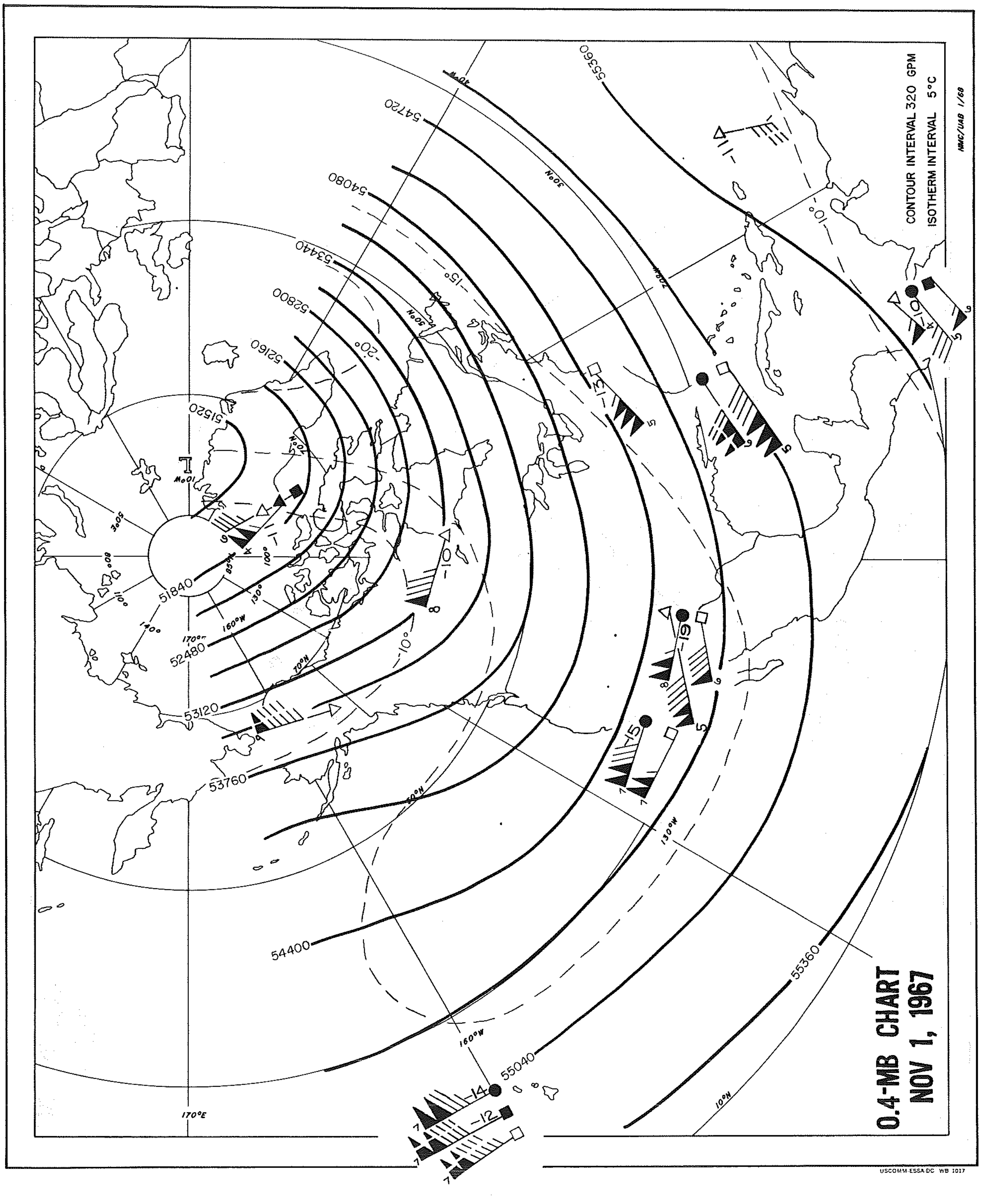
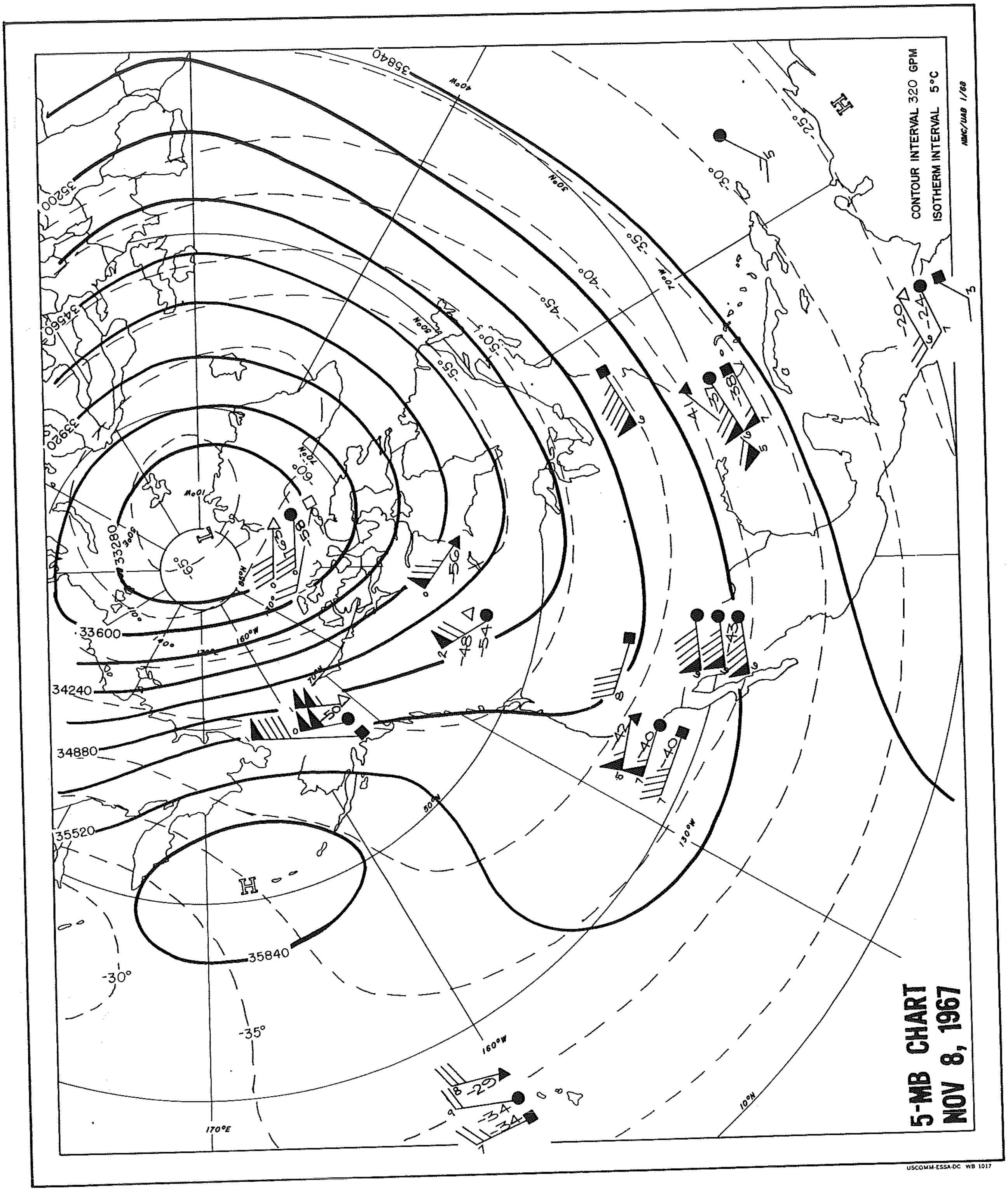

2-MB CHART
NOV 1, 1967
CONTOUR INTERVAL 320 GPM
ISOTHERM INTERVAL 5°C
NMC/UAB 1/68
39680
40000
40320
40640
40960
41280
41600
41920
42240
42560
42880
USCOMM-ESSA-DC WB 1017


0.4-MB CHART
NOV 1, 1967
CONTOUR INTERVAL 320 GPM
ISOTHERM INTERVAL 5°C
NMC/UAB 1/68
51520
51840
52160
52480
52800
53120
53440
53760
54080
54400
54720
55040
55360
USCOMM-ESSA DC WB 1017


5-MB CHART
NOV 8, 1967
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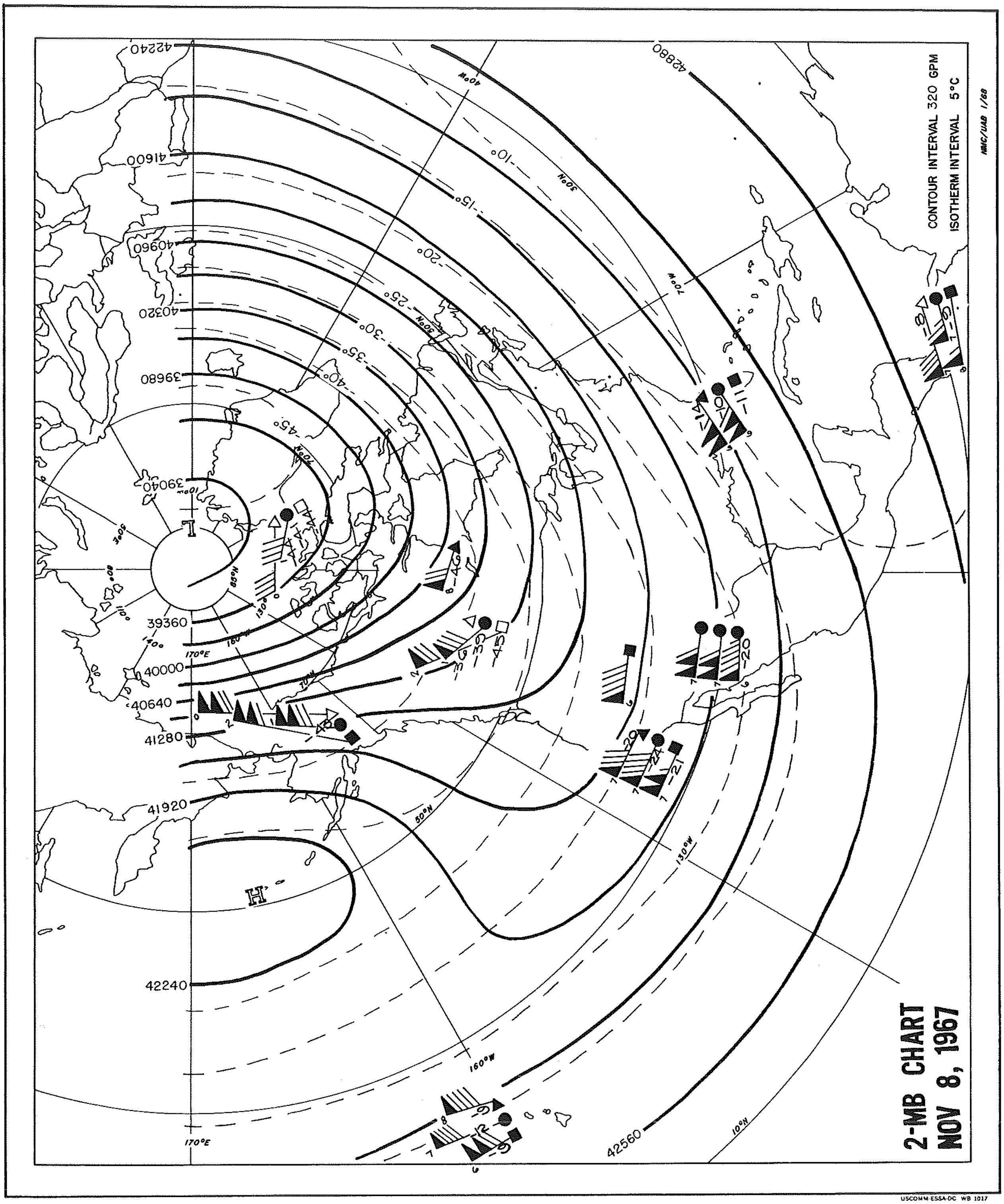
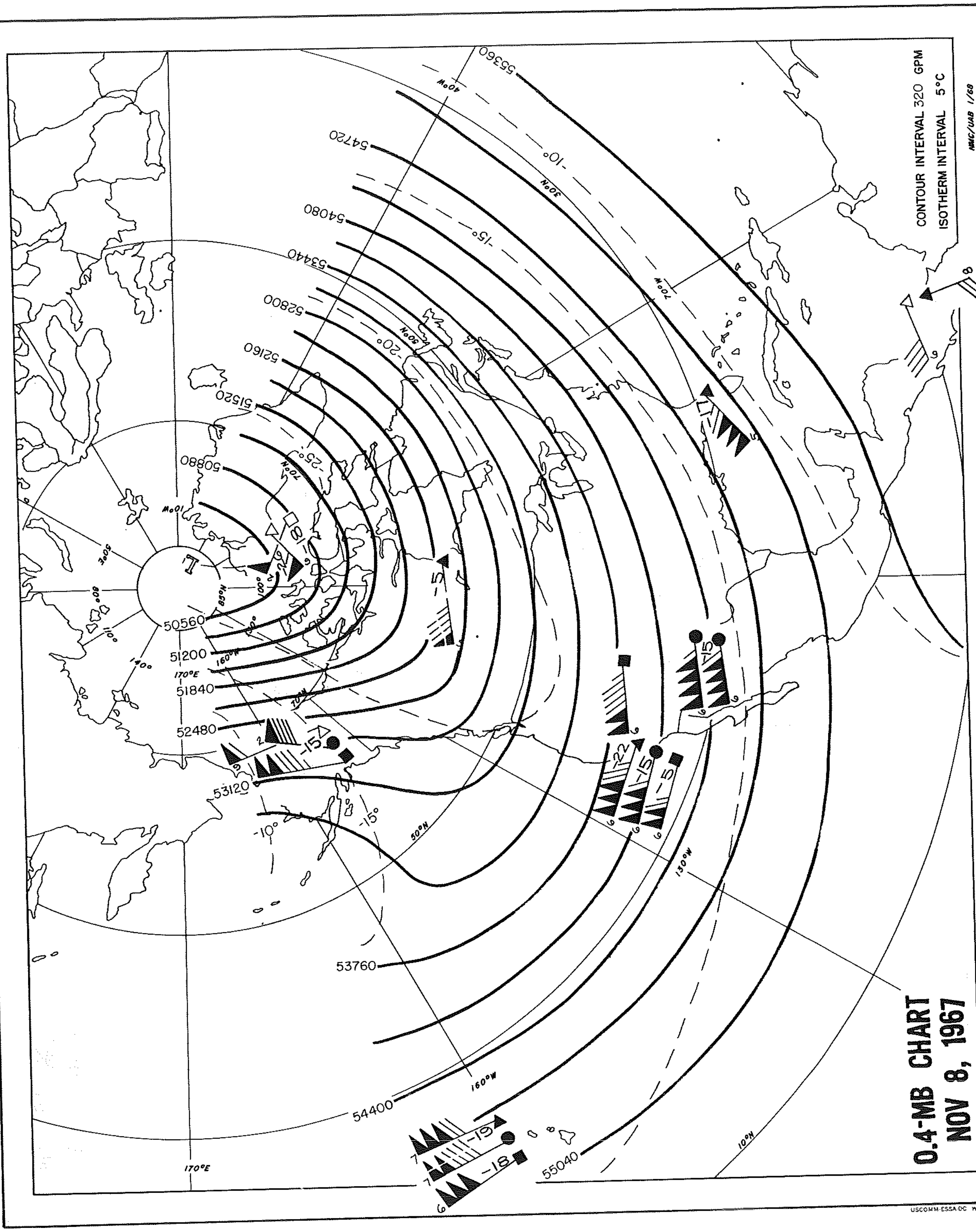
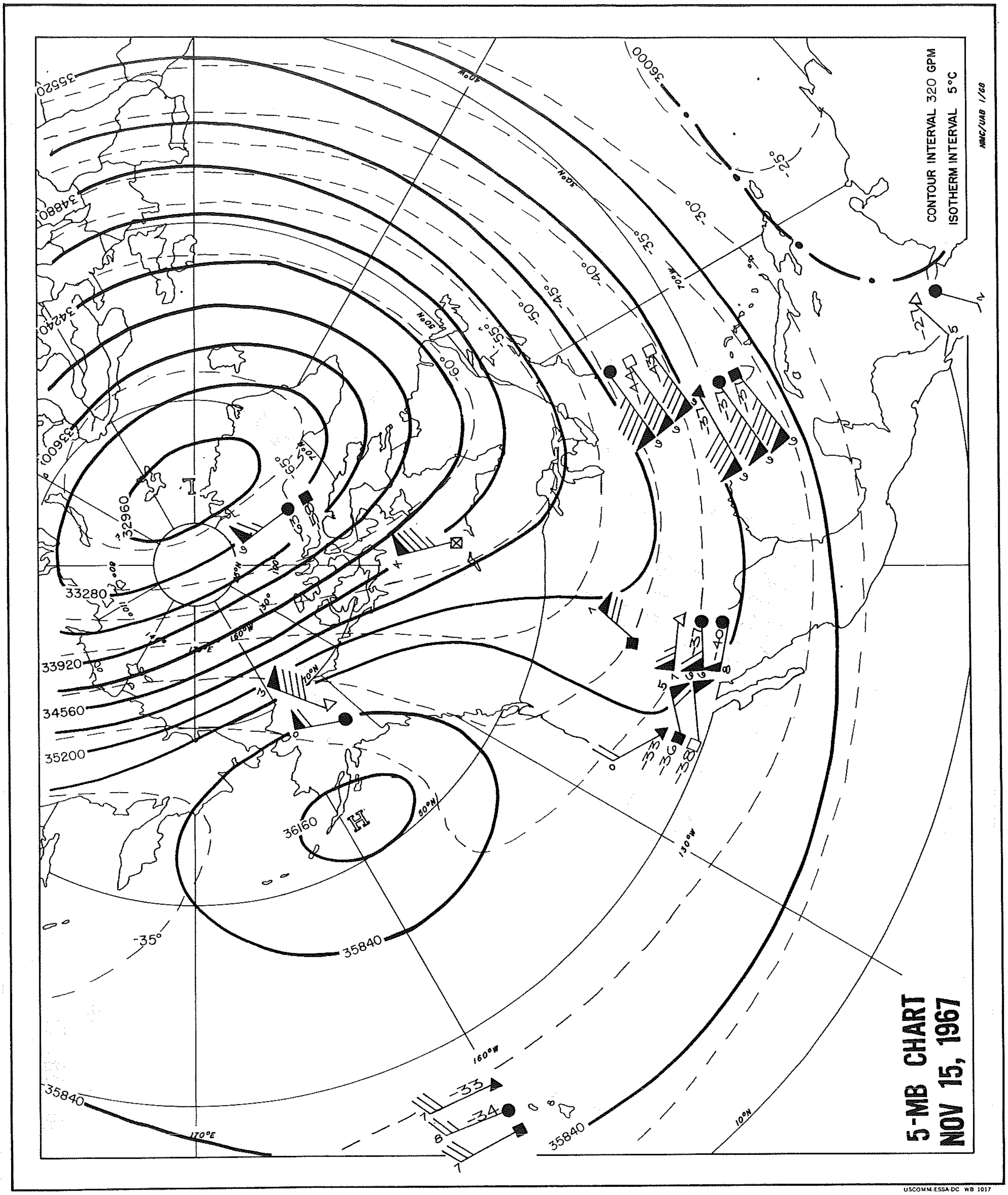
ISOTHERM INTERVAL 5°C
USCOMM-ESSA-DC WB 1017


2-MB CHART
NOV 8, 1967
CONTOUR INTERVAL 320 GPM
ISOTHERM INTERVAL 5°C
NMC/UAB 1/68
USCOMM-ESSA-DC WB 1017



0.4-MB CHART
NOV 8, 1967
CONTOUR INTERVAL 320 GPM
ISOTHERM INTERVAL 5°C
NMC/UAB 1/68
50560
51200
51840
52480
53120
53760
54400
55040
50880
51520
52160
52800
53440
54080
54720
55360
USCOMM-ESSA-DC WB 1017


5-MB CHART
NOV 15, 1967
CONTOUR INTERVAL 320 GPM
ISOTHERM INTERVAL 5°C
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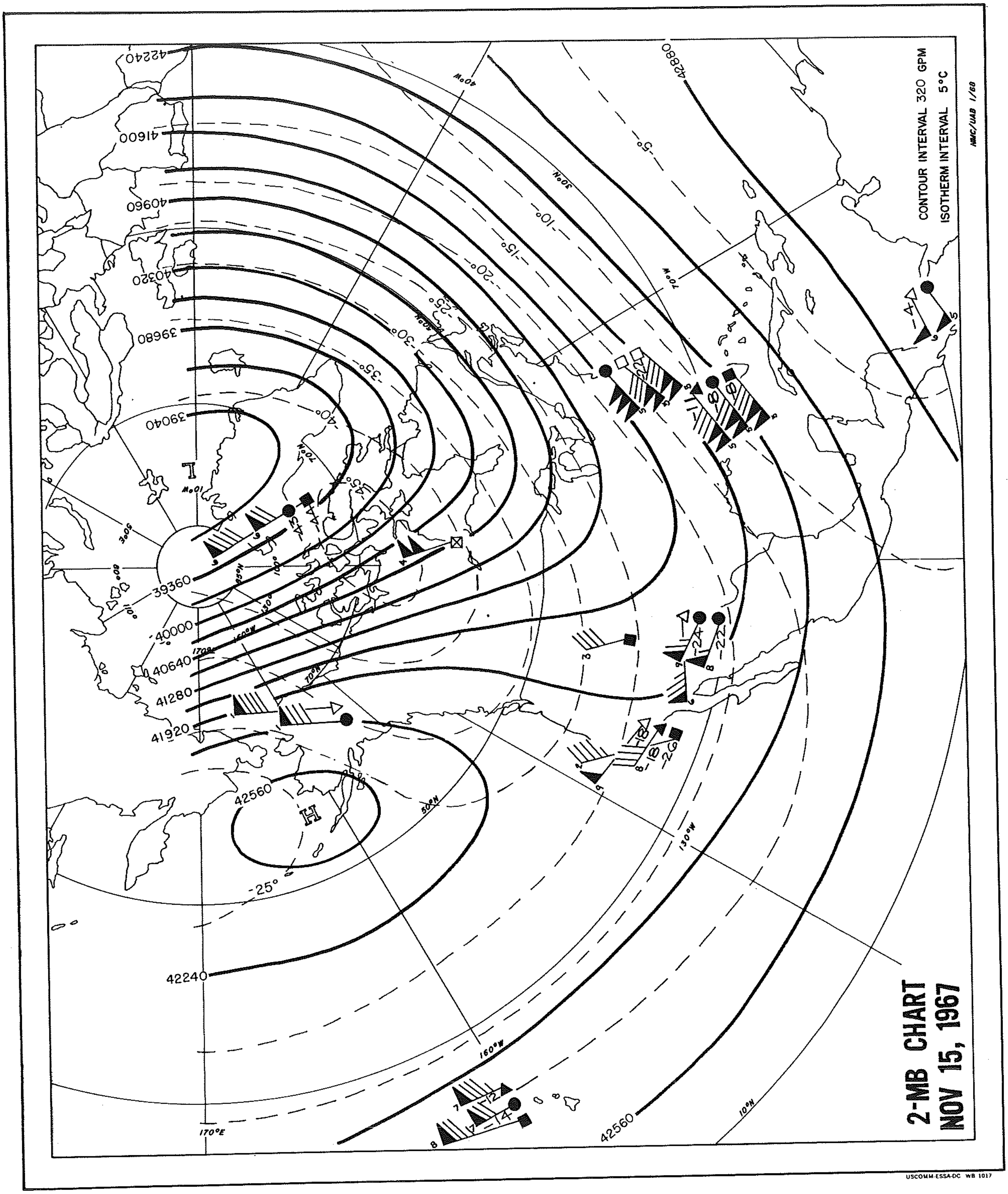
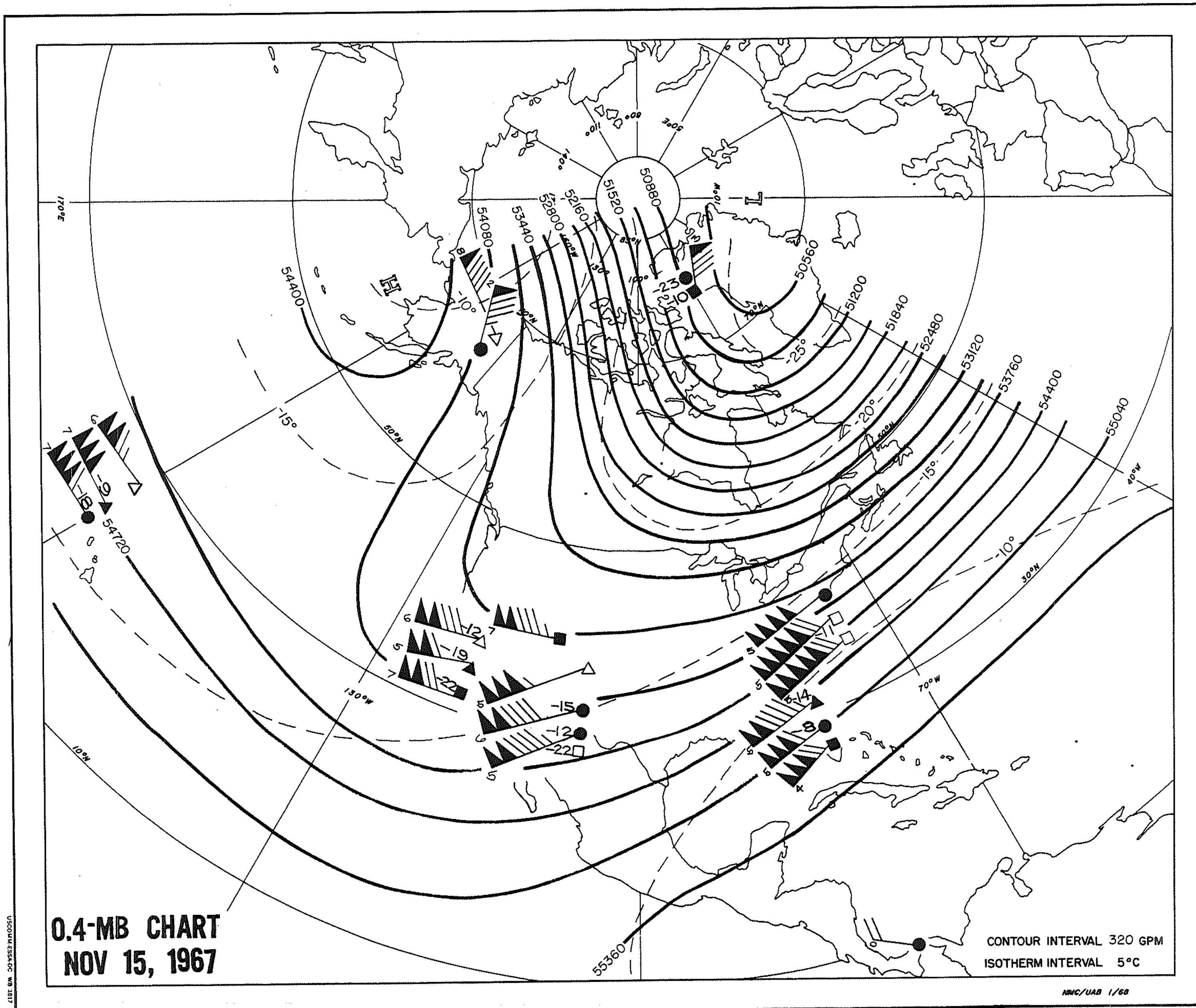
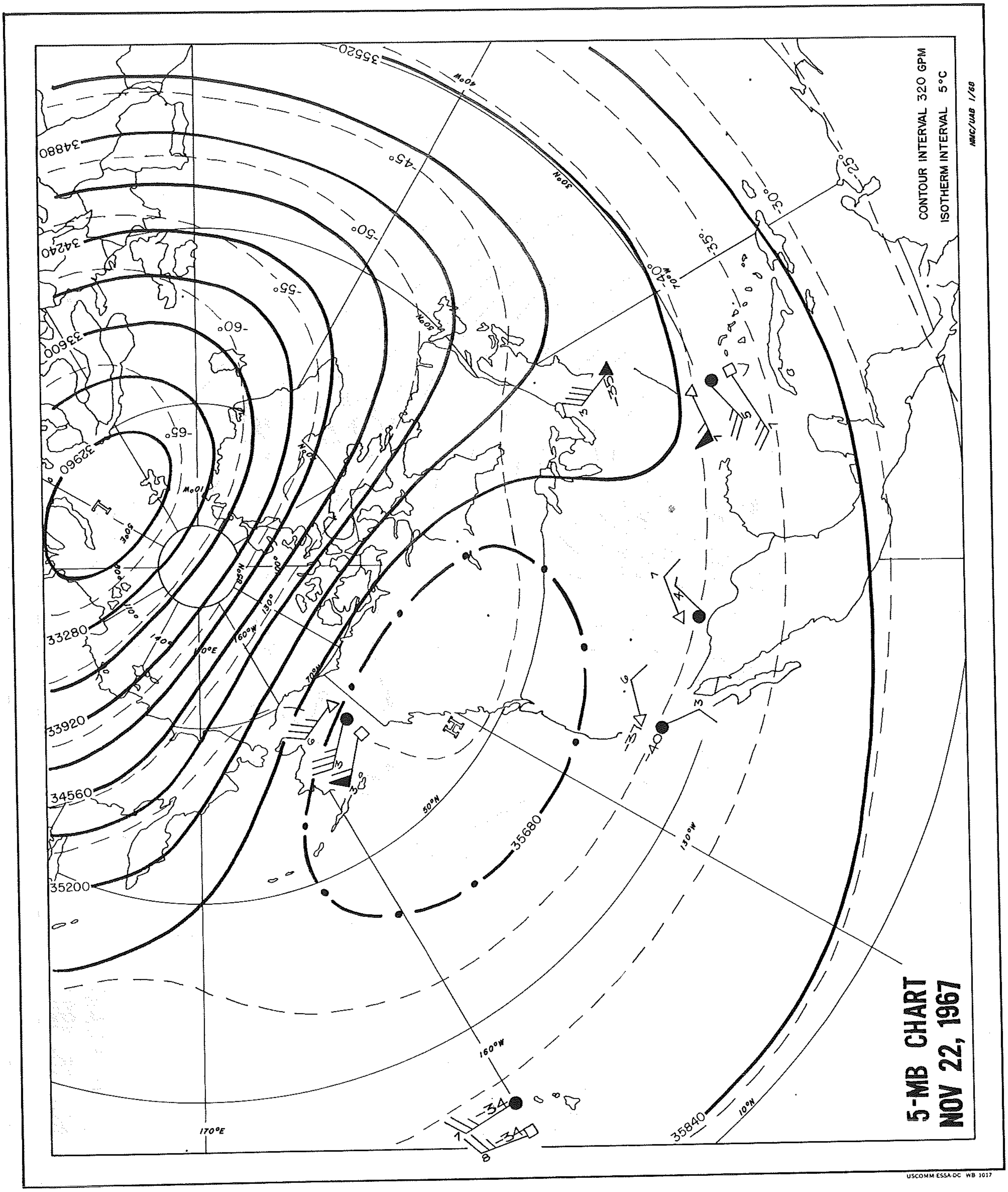
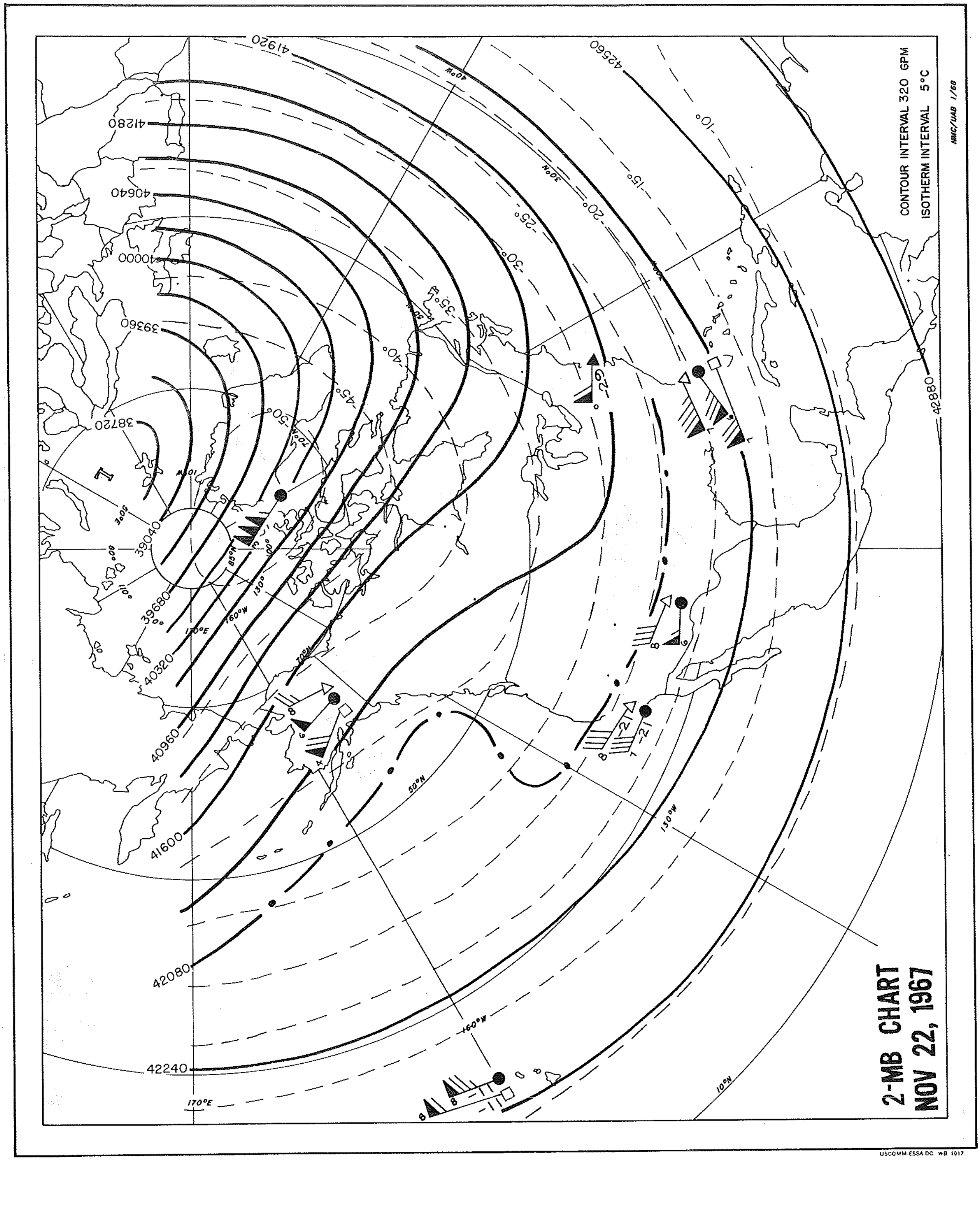
34880
34240
33600
32960
33280
33920
34560
35200
35840
36160
36000
L
H

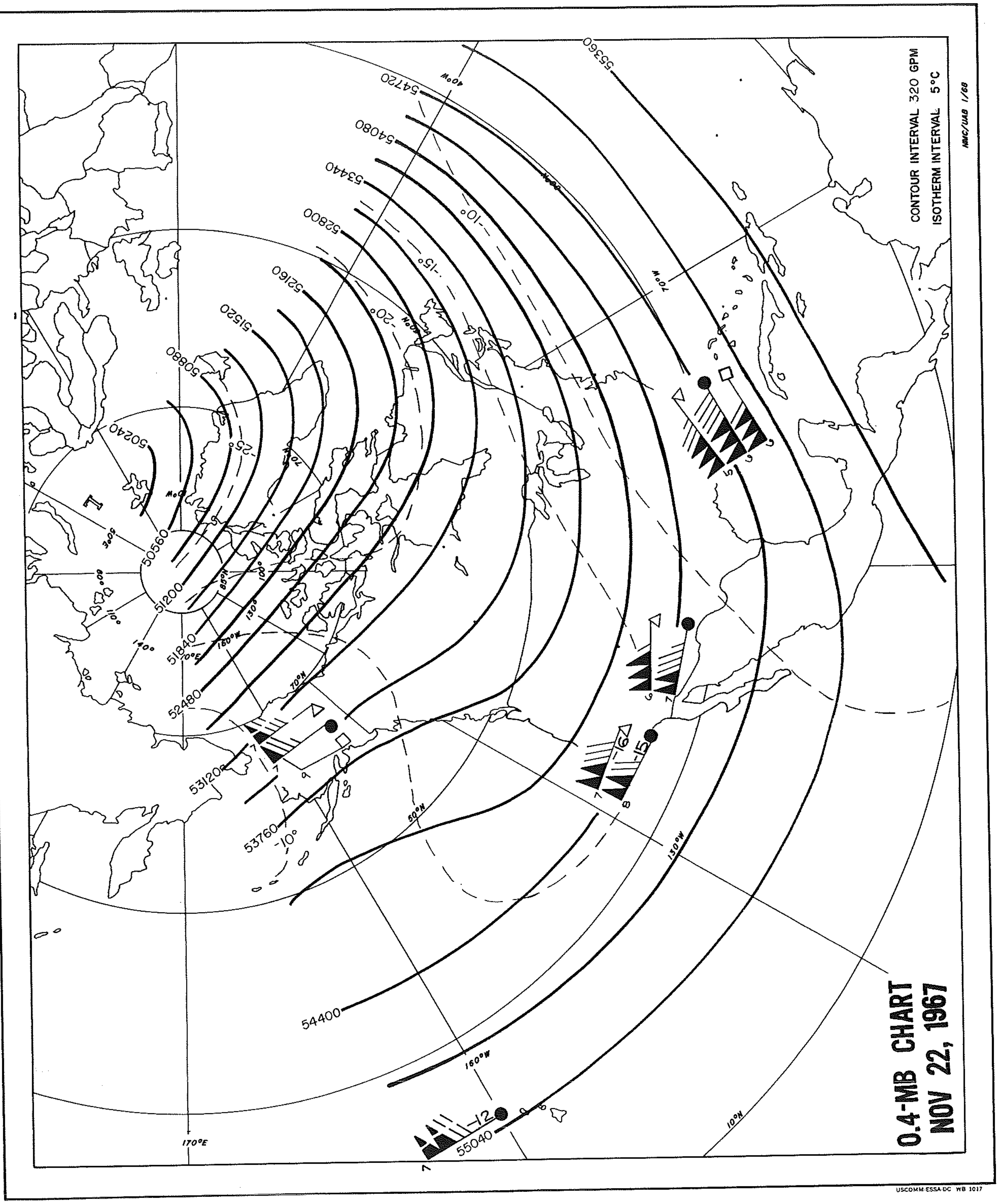

2-MB CHART
NOV 15, 1967
CONTOUR INTERVAL 320 GPM
ISOTHERM INTERVAL 5°C
42240
41600
40960
40320
39680
39040
39360
40000
40640
41280
41920
42560
42880
L
H
-25°
USCOMM-ESSA-DC WB 1017



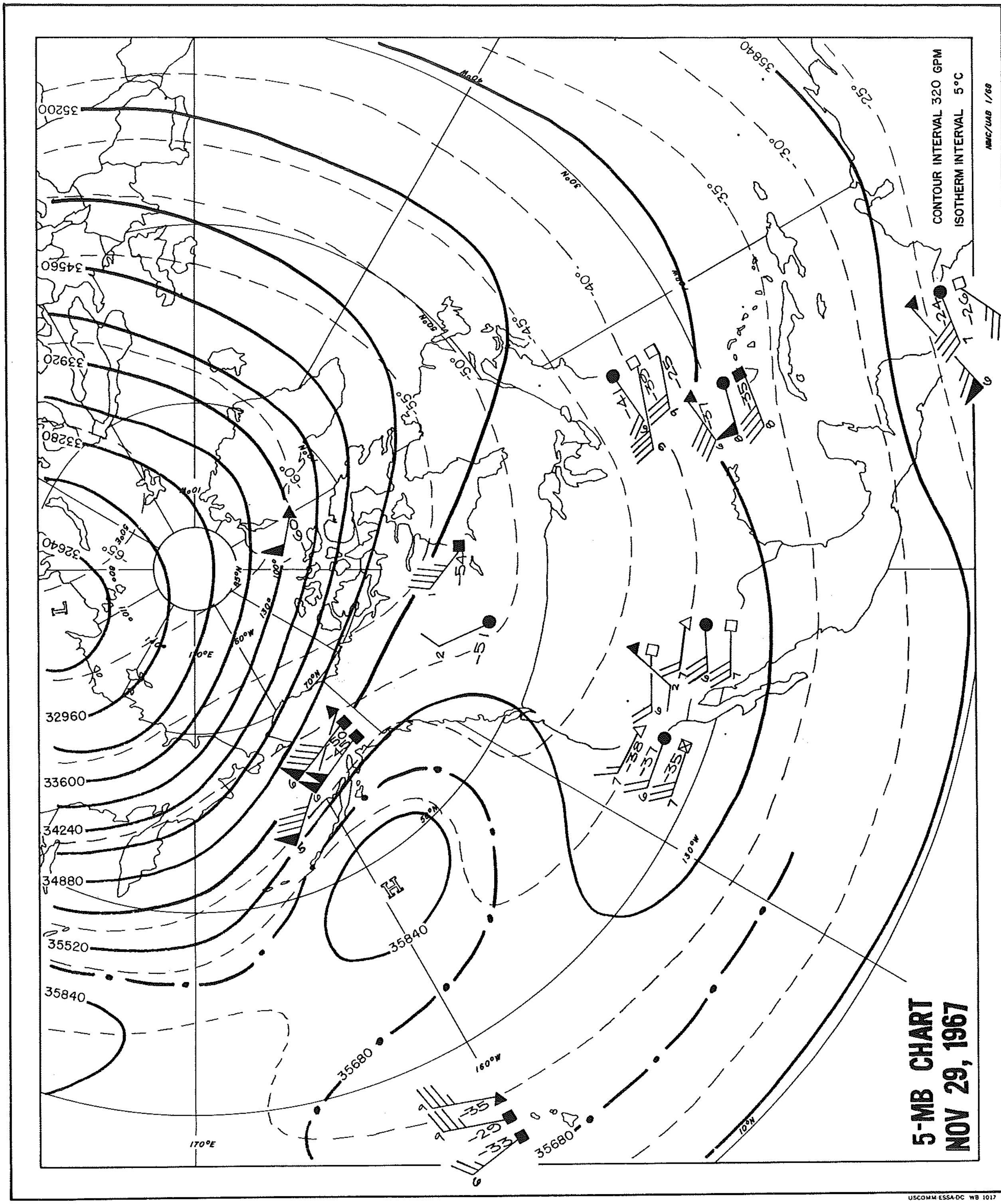
0.4-MB CHART
NOV 15, 1967

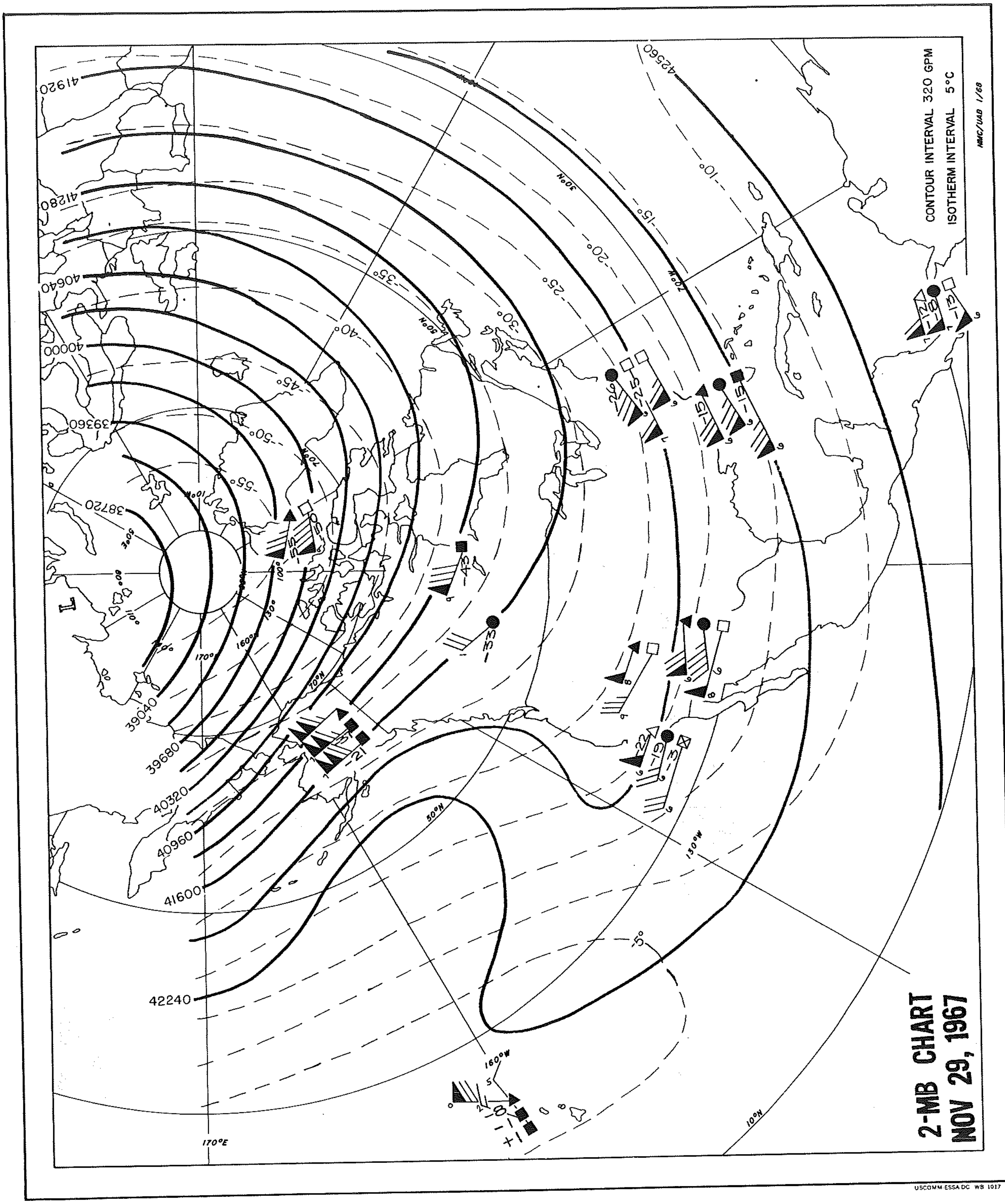

5-MB CHART
NOV 22, 1967
CONTOUR INTERVAL 320 GPM
ISOTHERM INTERVAL 5°C
NMC/UAB 1/68
USCOMM-ESSA-DC WB 1017

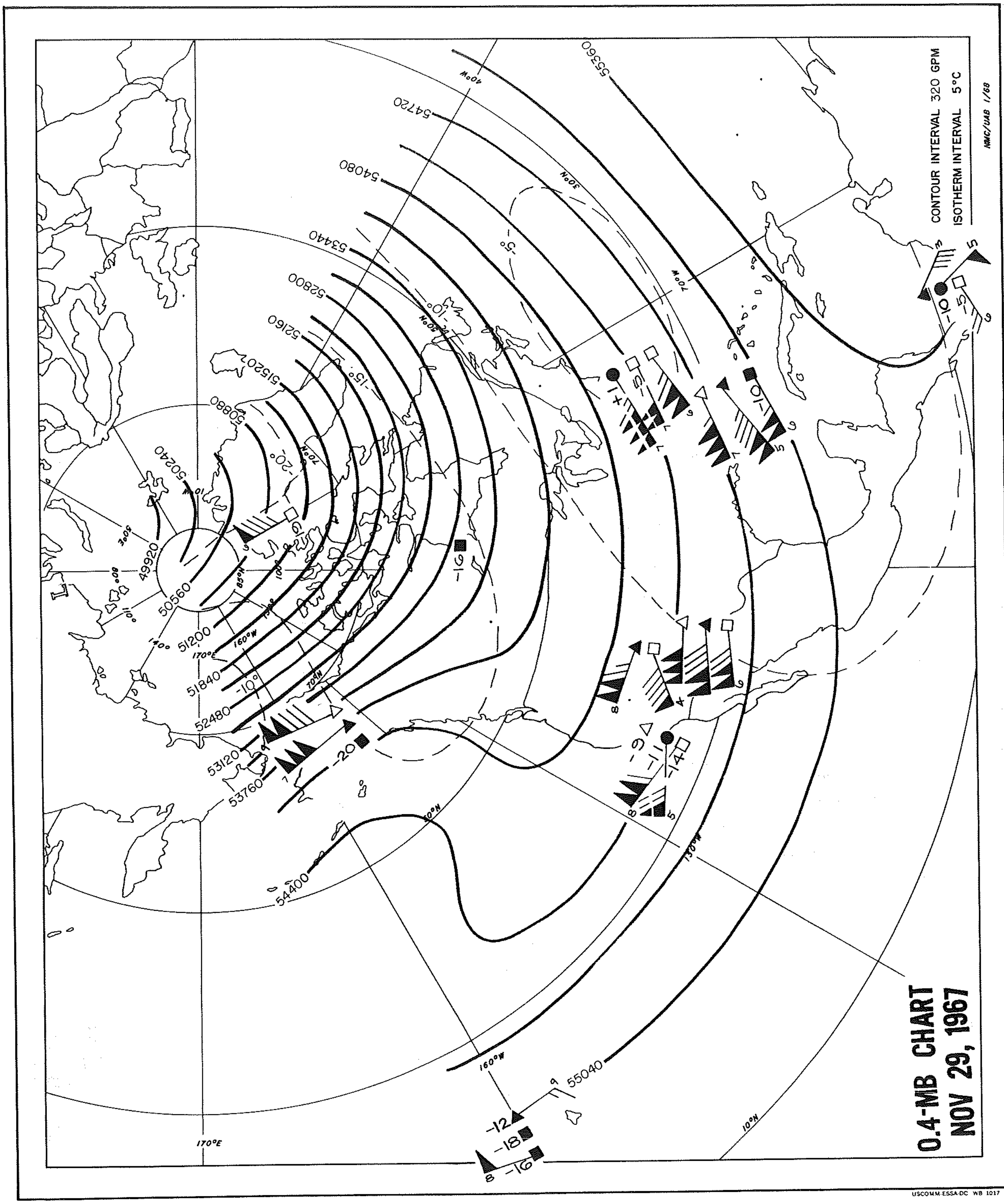

2-MB CHART
NOV 22, 1967
CONTOUR INTERVAL 320 GPM
ISOTHERM INTERVAL 5°C
38720
39040
39360
39680
40000
40320
40640
40960
41280
41600
41920
42080
42240
42560
42880
USCOMM-ESSA-DC WB 1017



USCOMM-ESSA-DC WB 1017


5-MB CHART
NOV 29, 1967
CONTOUR INTERVAL 320 GPM
ISOTHERM INTERVAL 5°C
32640
32960
33280
33600
33920
34240
34560
34880
35200
35520
35840
35680
USCOMM-ESSA-DC WB 1017


2-MB CHART
NOV 29, 1967
CONTOUR INTERVAL 320 GPM
ISOTHERM INTERVAL 5°C
NMC/UAB 1/68
38720
39040
39360
39680
40000
40320
40640
40960
41280
41600
41920
42240
42560
USCOMM-ESSA DC WB 1017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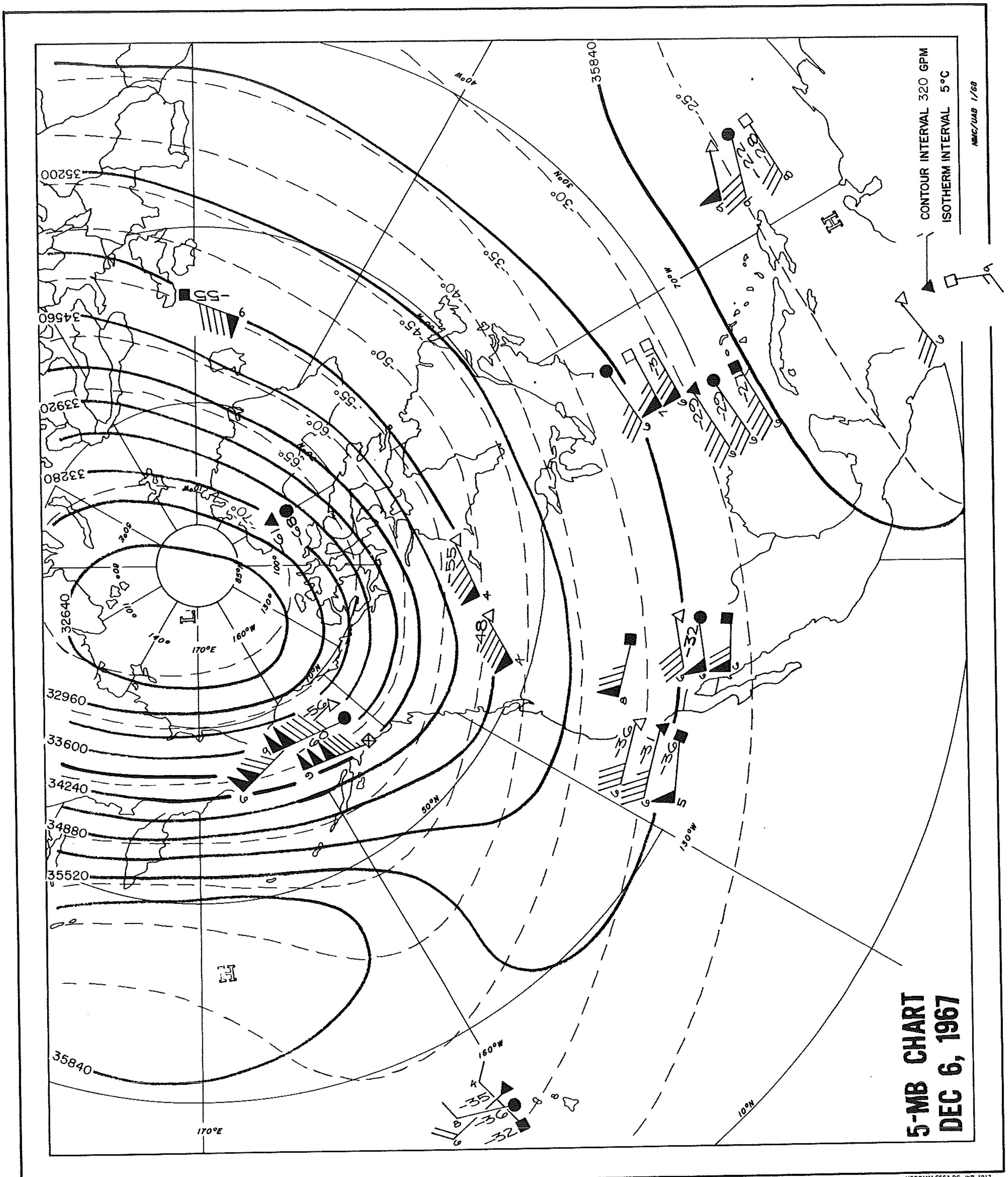
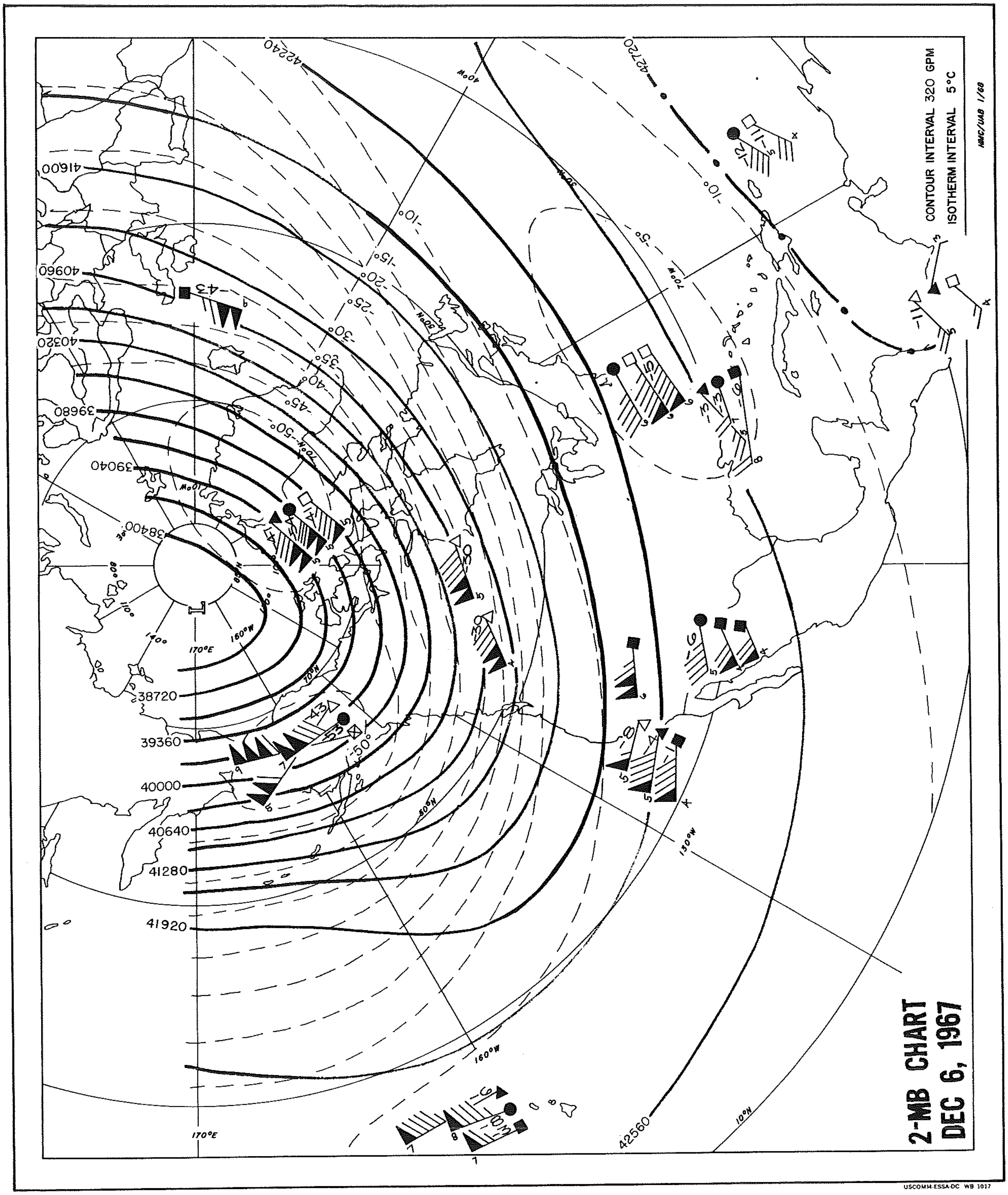
NOV 29, 1967
CONTOUR INTERVAL 320 GPM
ISOTHERM INTERVAL 5°C
NMC/UAB 1/68
USCOMM-ESSA-DC WB 1017


5-MB CHART
DEC 6, 1967
CONTOUR INTERVAL 320 GPM
ISOTHERM INTERVAL 5°C
32640
32960
33280
33600
33920
34240
34560
34880
35200
35520
35840
35840
L
H
H
-25°
-30°
-35°
-40°
-45°
-50°
-55°
-60°
-65°
-70°
170°E
160°W
130°W
100°W
70°W
40°W
10°N
30°N
50°N
70°N
USCOMM-ESSA-DC WB 1017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DEC 6, 1967
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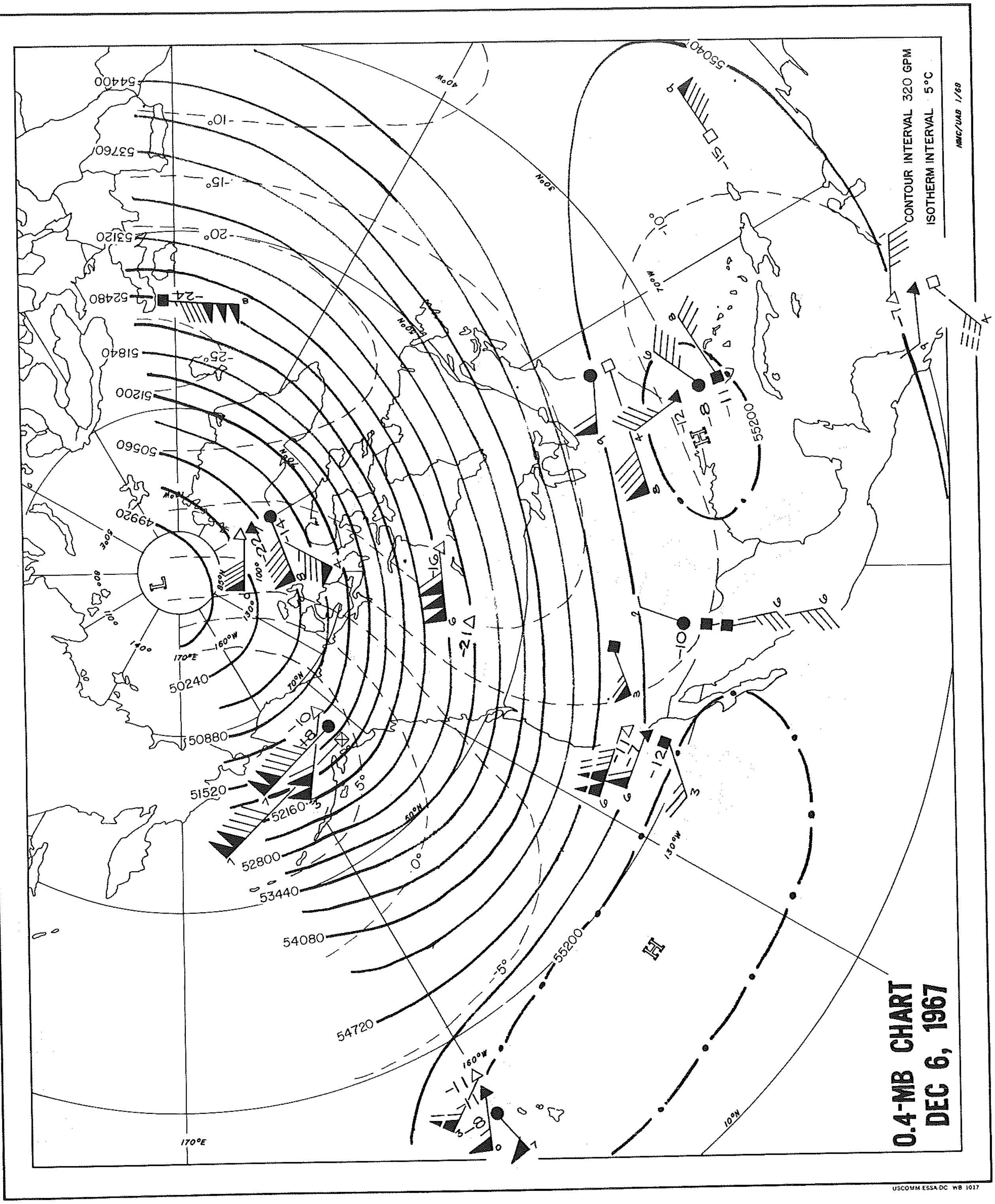
ISOTHERM INTERVAL 5°C
USCOMM-ESSA-DC WB 1017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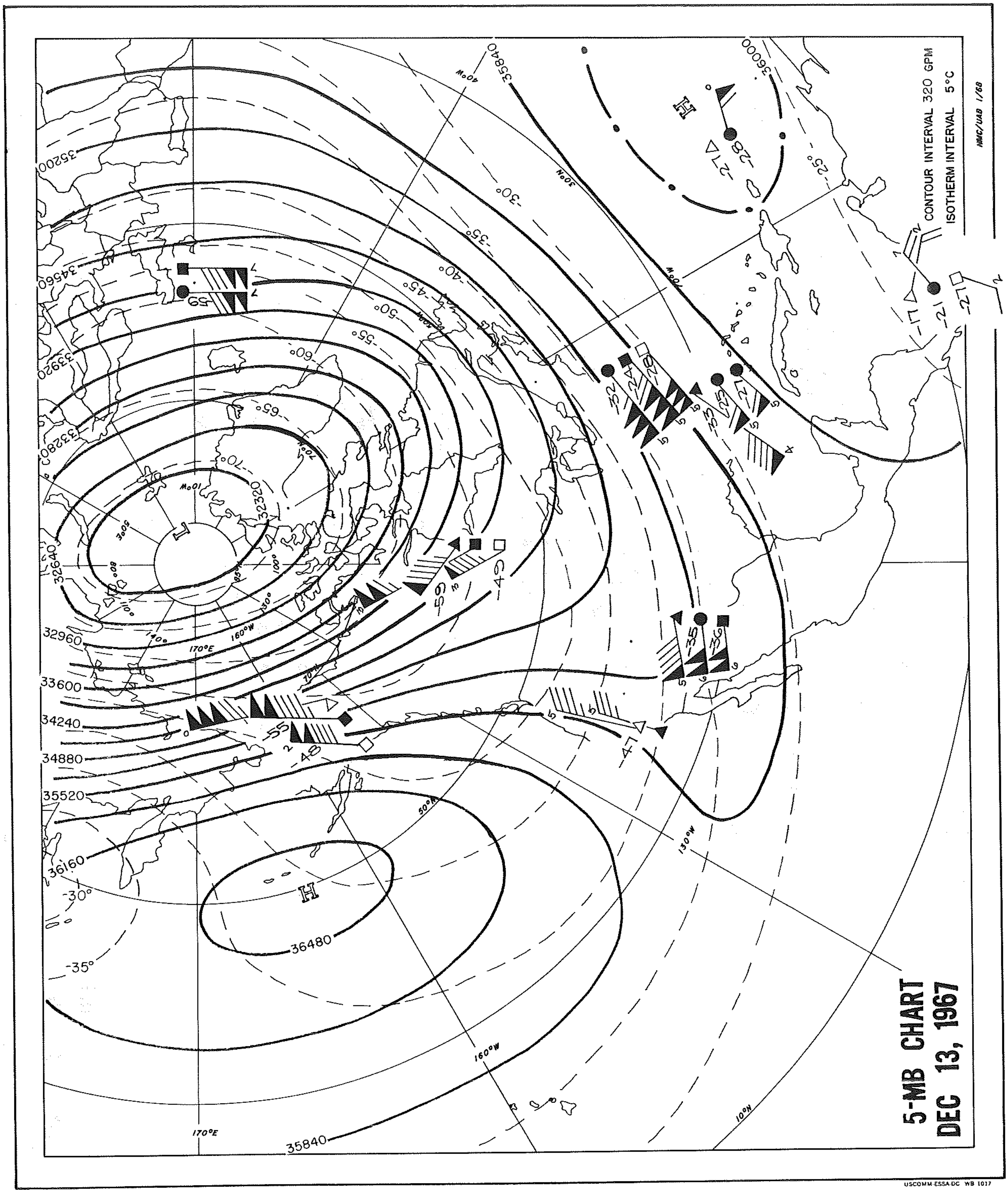
DEC 6, 1967
CONTOUR INTERVAL 320 GPM
ISOTHERM INTERVAL 5°C
NMC/UAB 1/68
USCOMM-ESSA-DC WB 1017
49920
50240
50560
50880
51200
51520
51840
52160
52480
52800
53120
53440
53760
54080
54400
54720
55040
55200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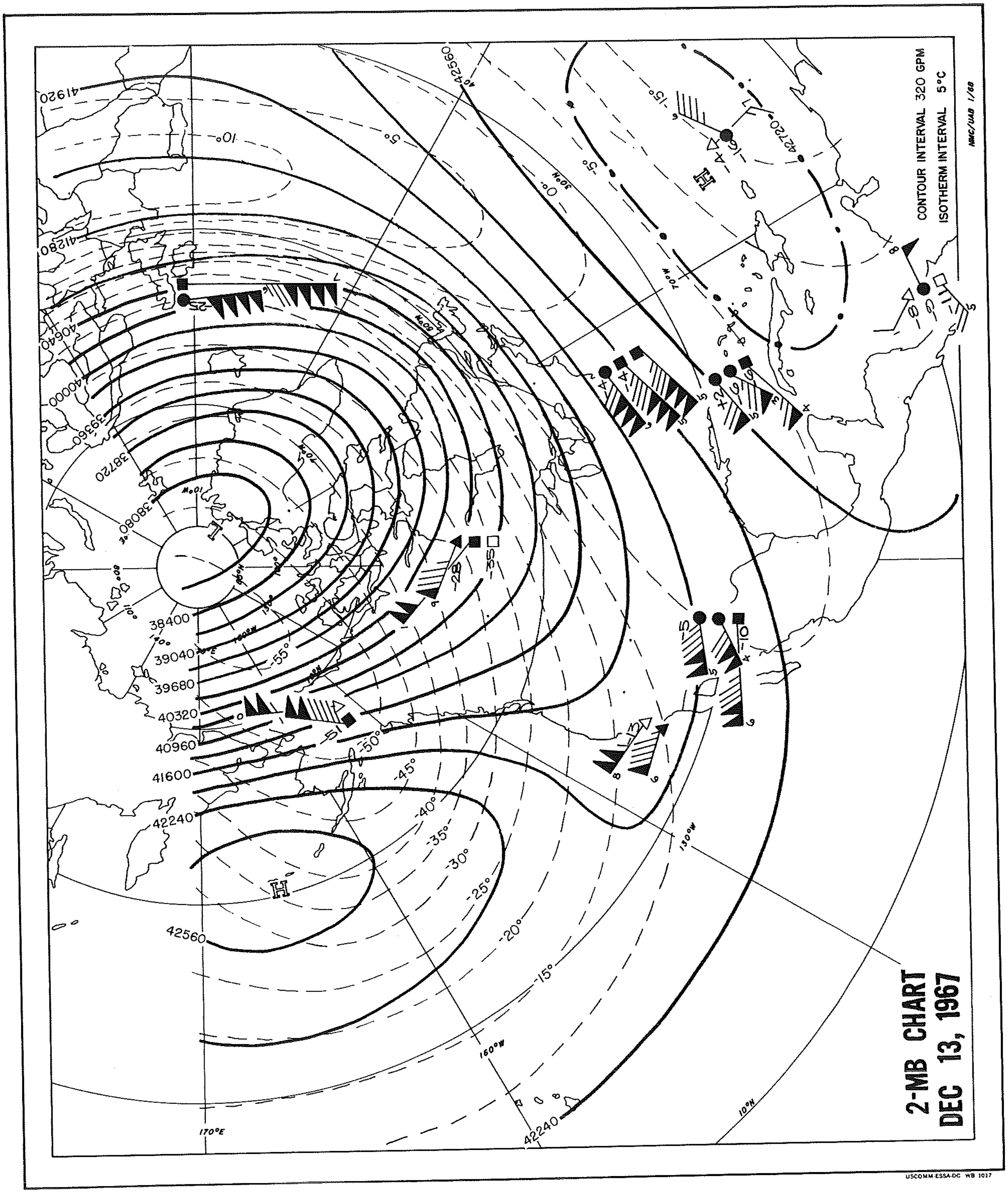
DEC 13, 1967
CONTOUR INTERVAL 320 GPM
ISOTHERM INTERVAL 5°C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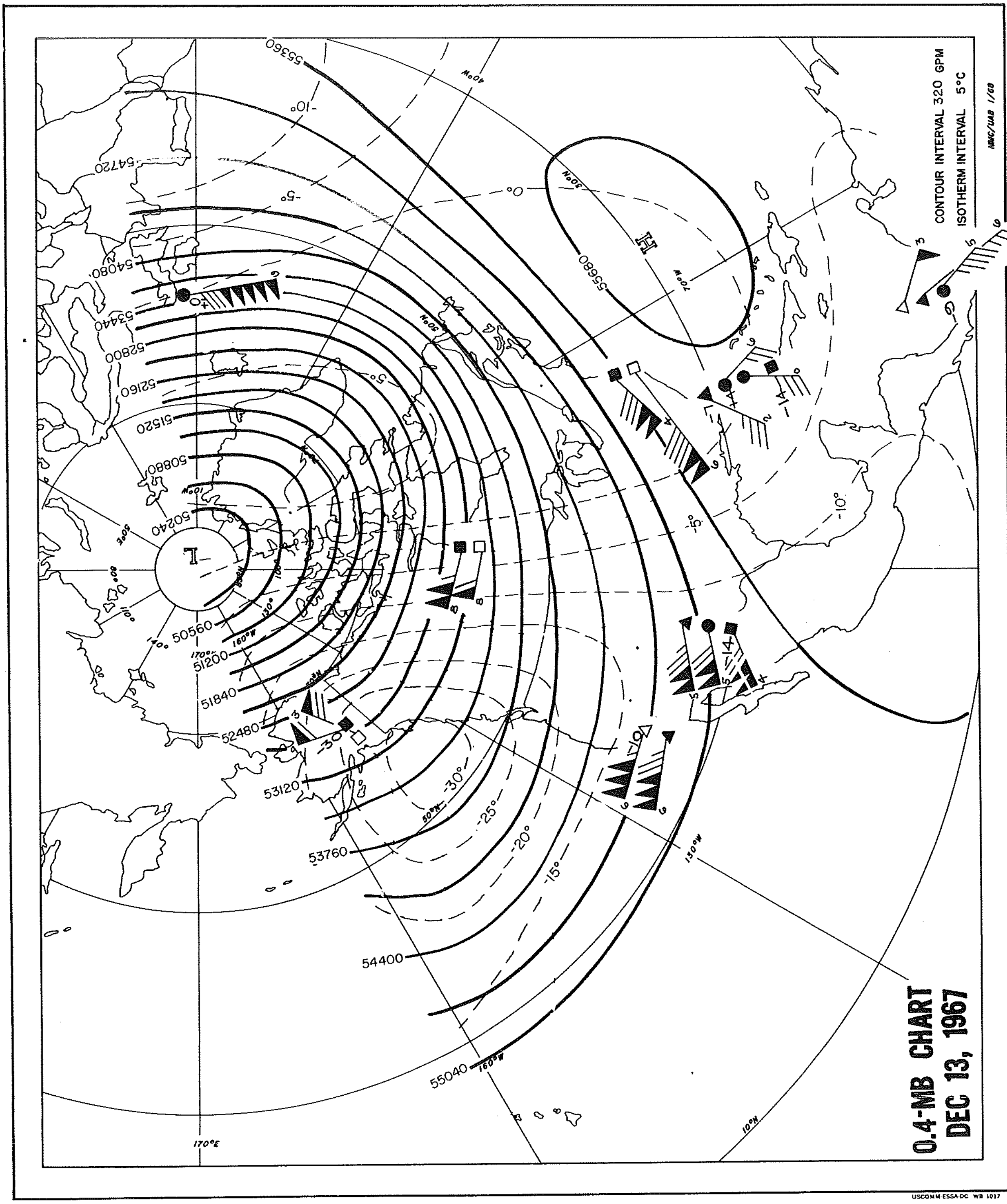
CONTOUR INTERVAL 320 GPM
ISOTHERM INTERVAL 5°C
USCOMM-ESSA-DC WB 1017



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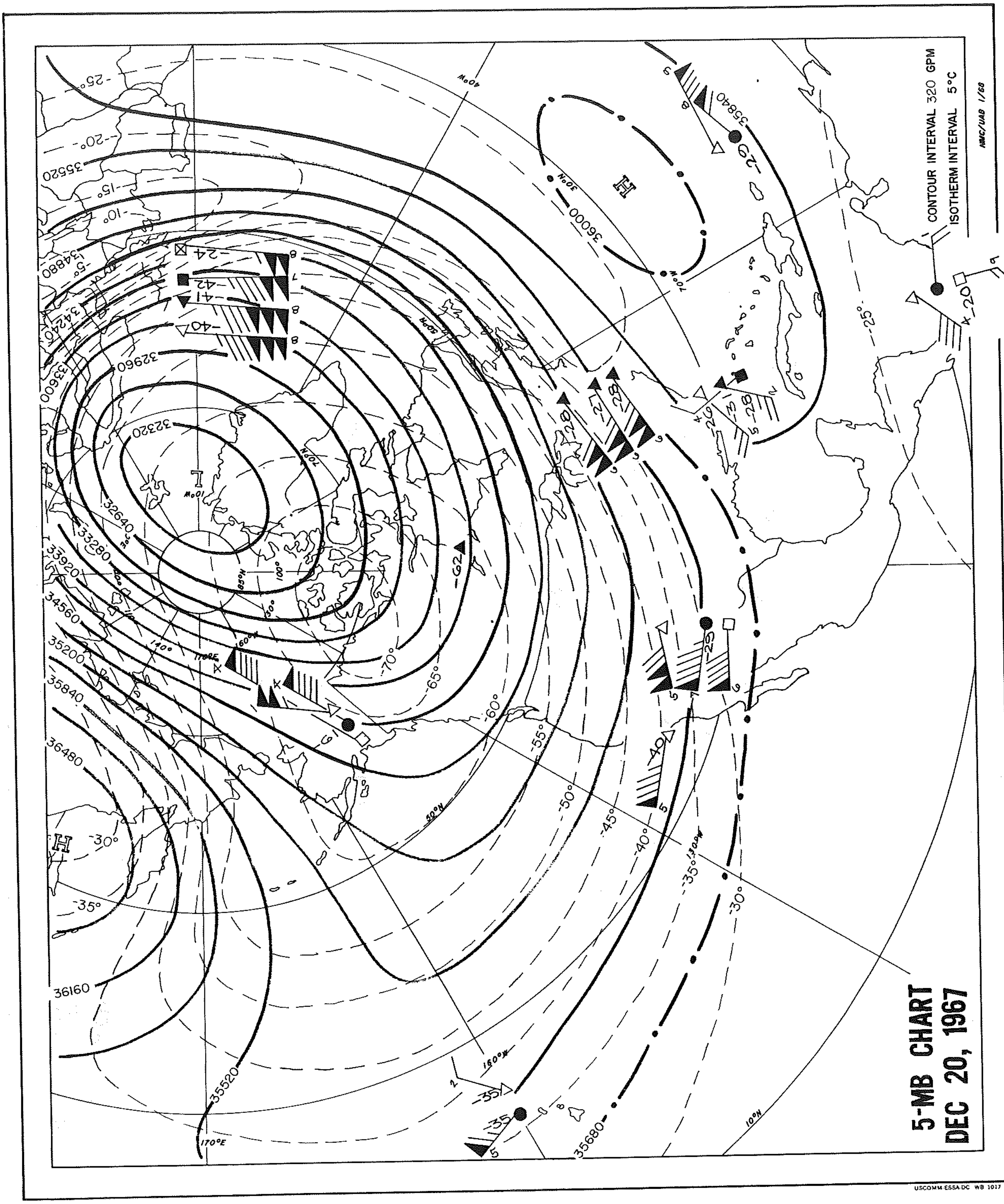
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DEC 20, 1967
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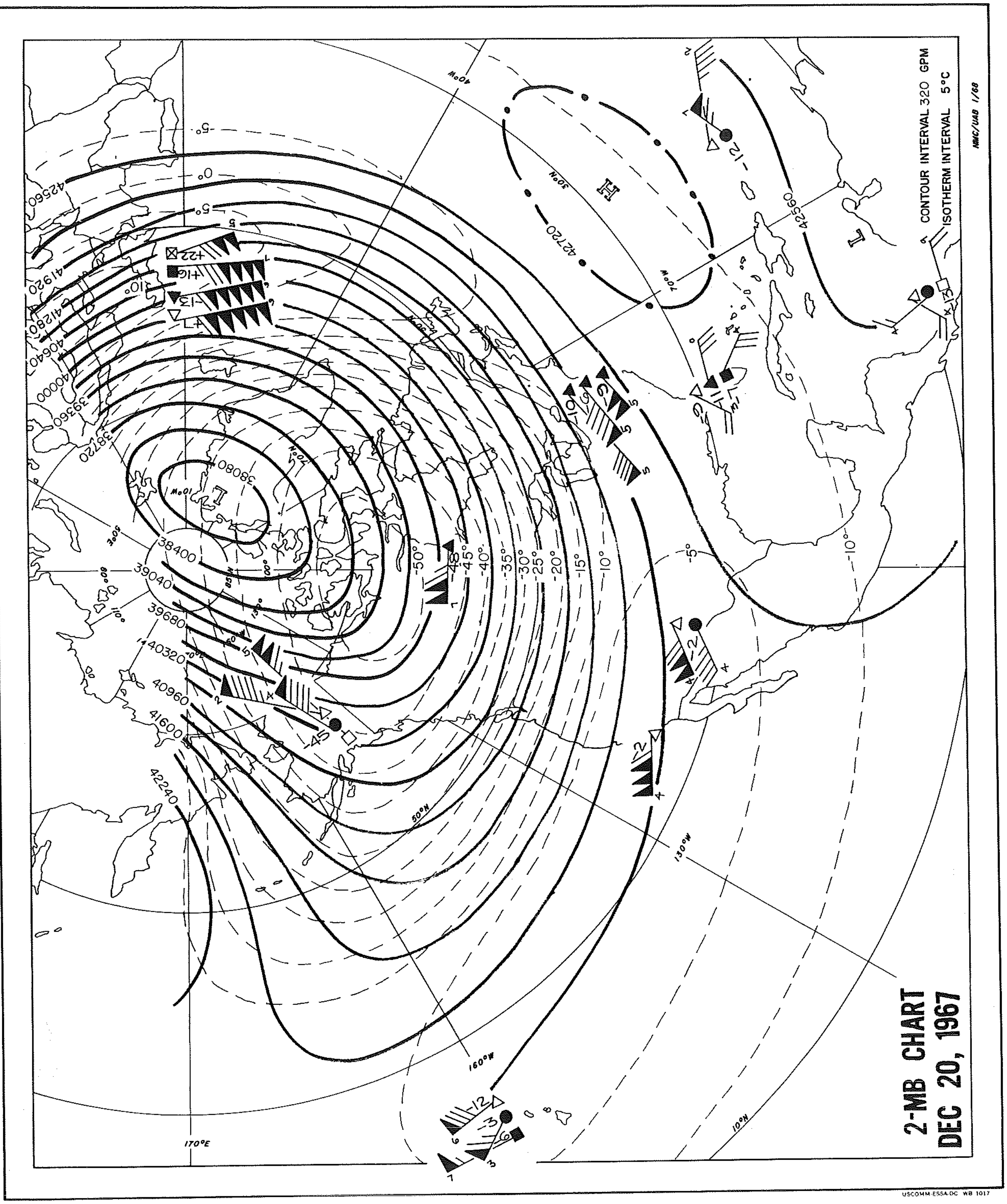
USCOMM-ESSA-DC WB 1017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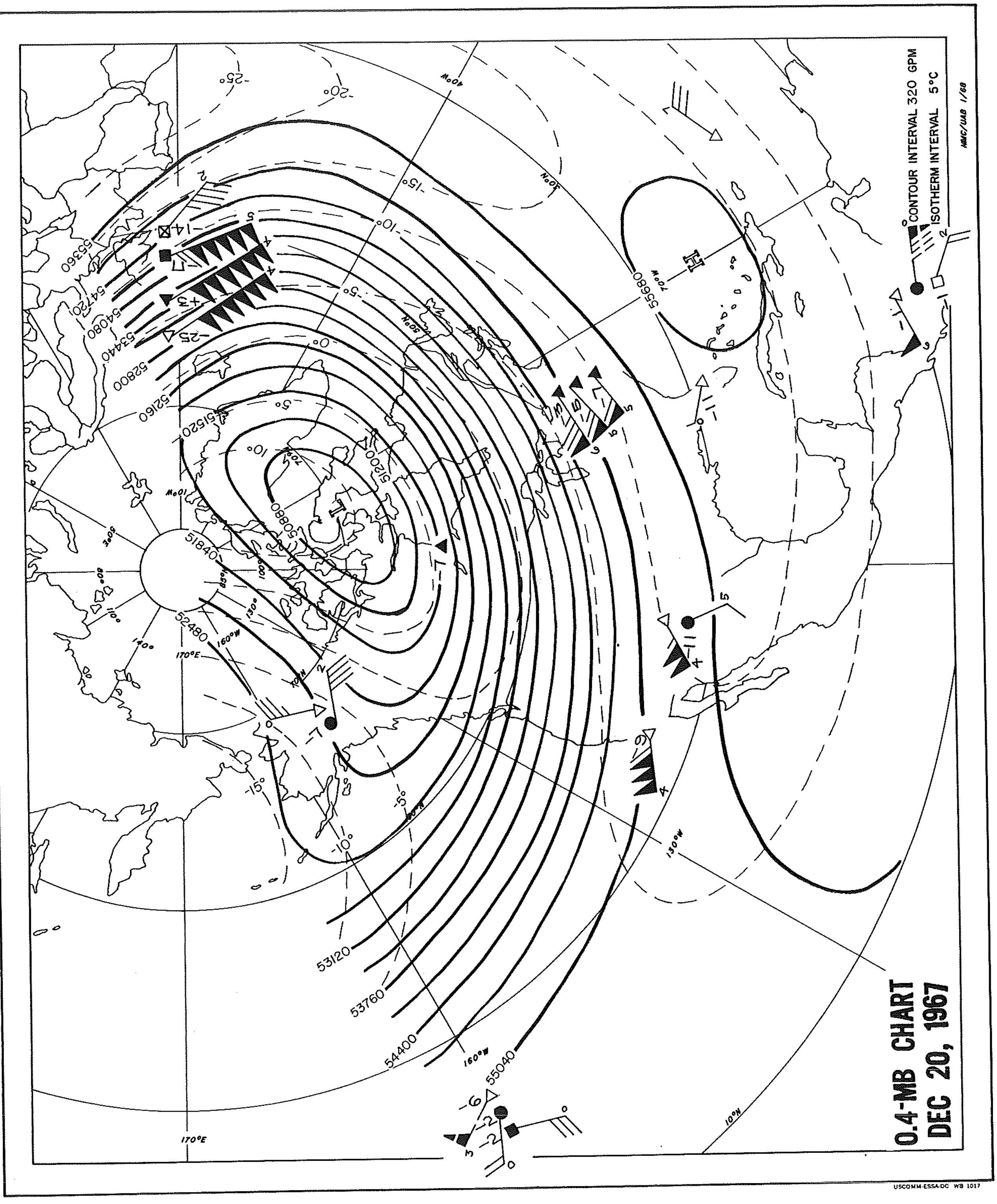
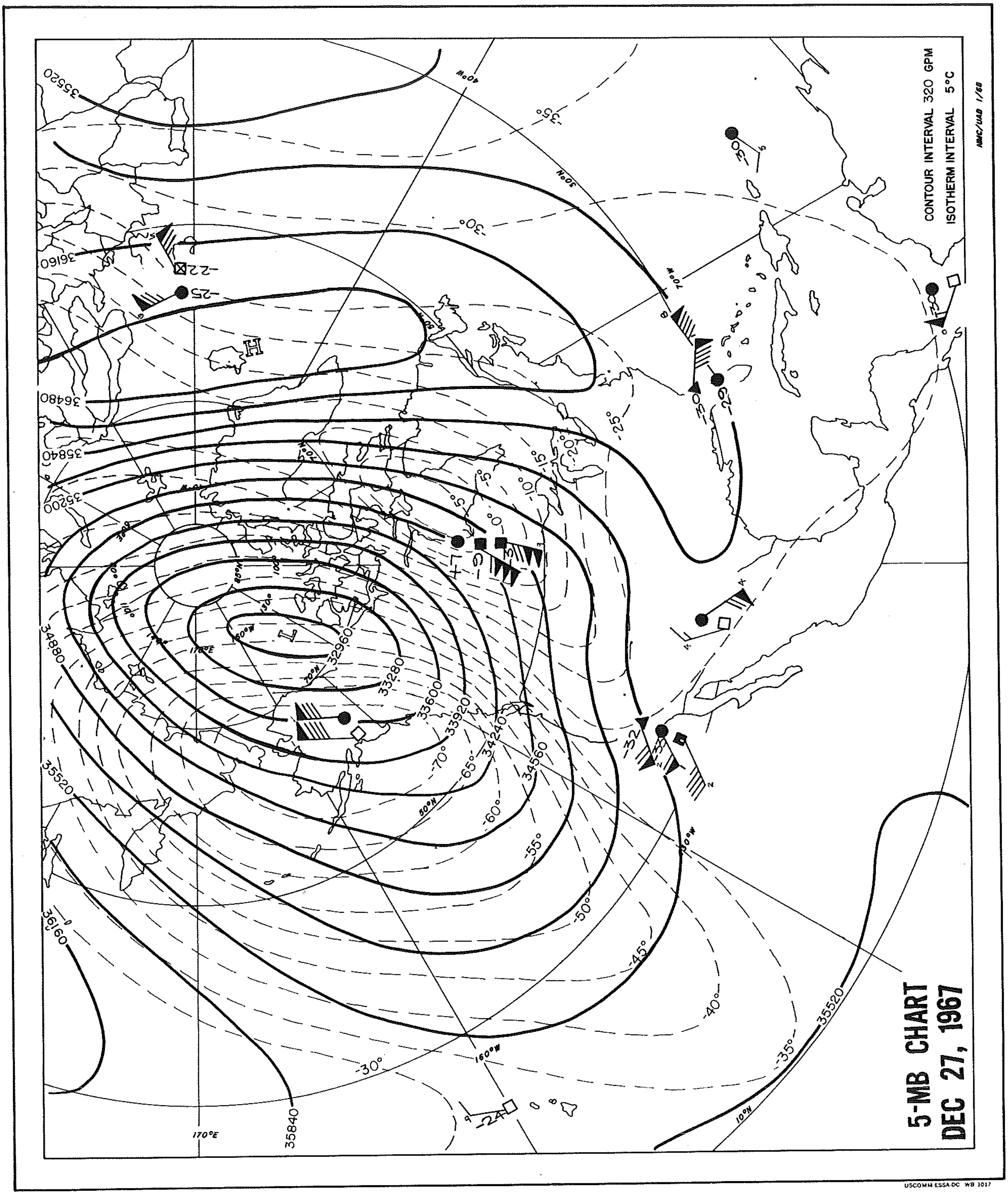
DEC 20, 1967
CONTOUR INTERVAL 320 GPM
ISOTHERM INTERVAL 5°C
NMC/UAB 1/68
USCOMM-ESSA-DC WB 1017


0.4-MB CHART
DEC 20, 1967
CONTOUR INTERVAL 320 GPM
ISOTHERM INTERVAL 5°C
NMC/UAB 1/68
USCOMM-ESSA-DC WB 1017
50880
51200
51520
51840
52160
52480
52800
53120
53440
53760
54080
54400
54720
55040
55360
55680



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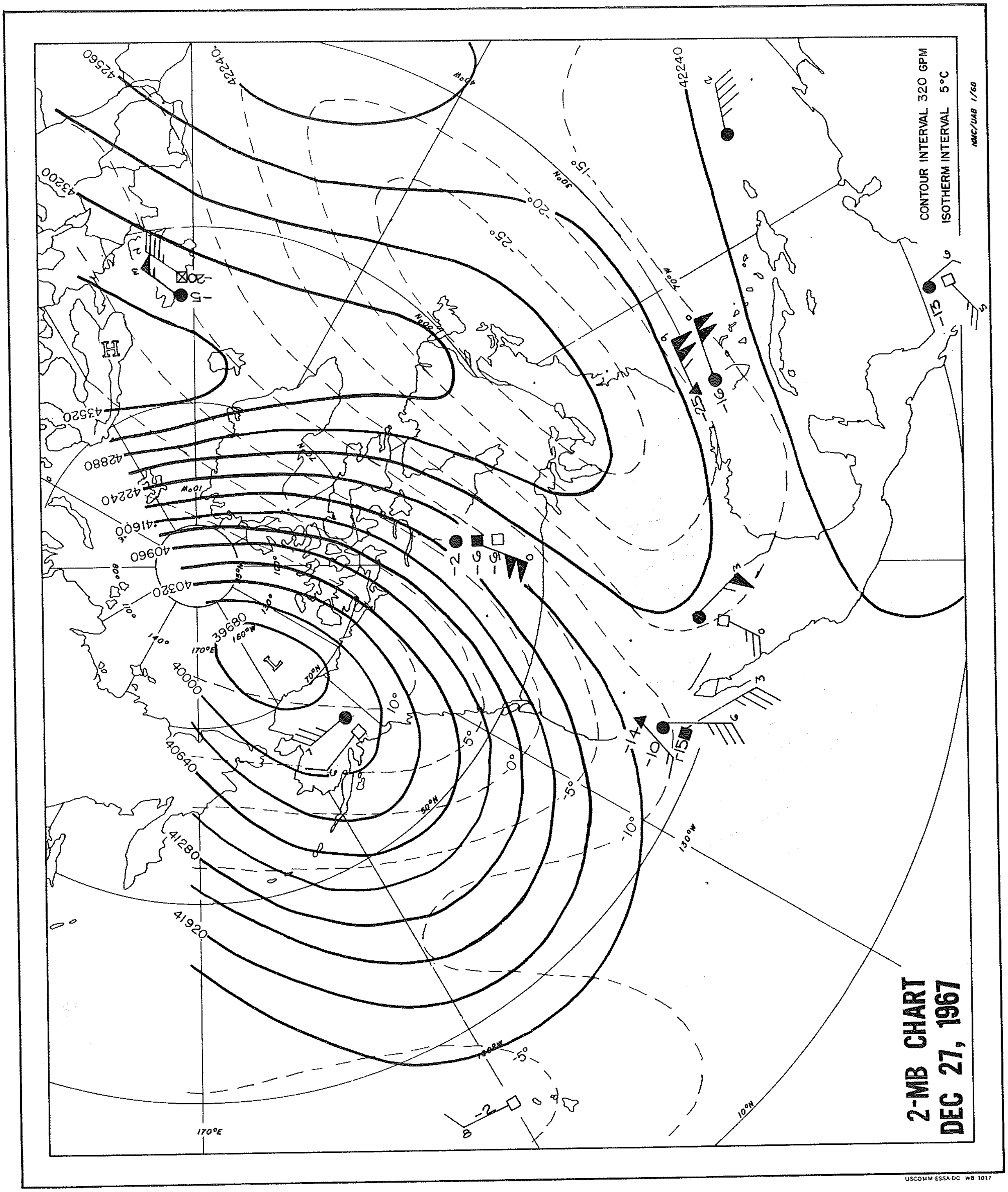
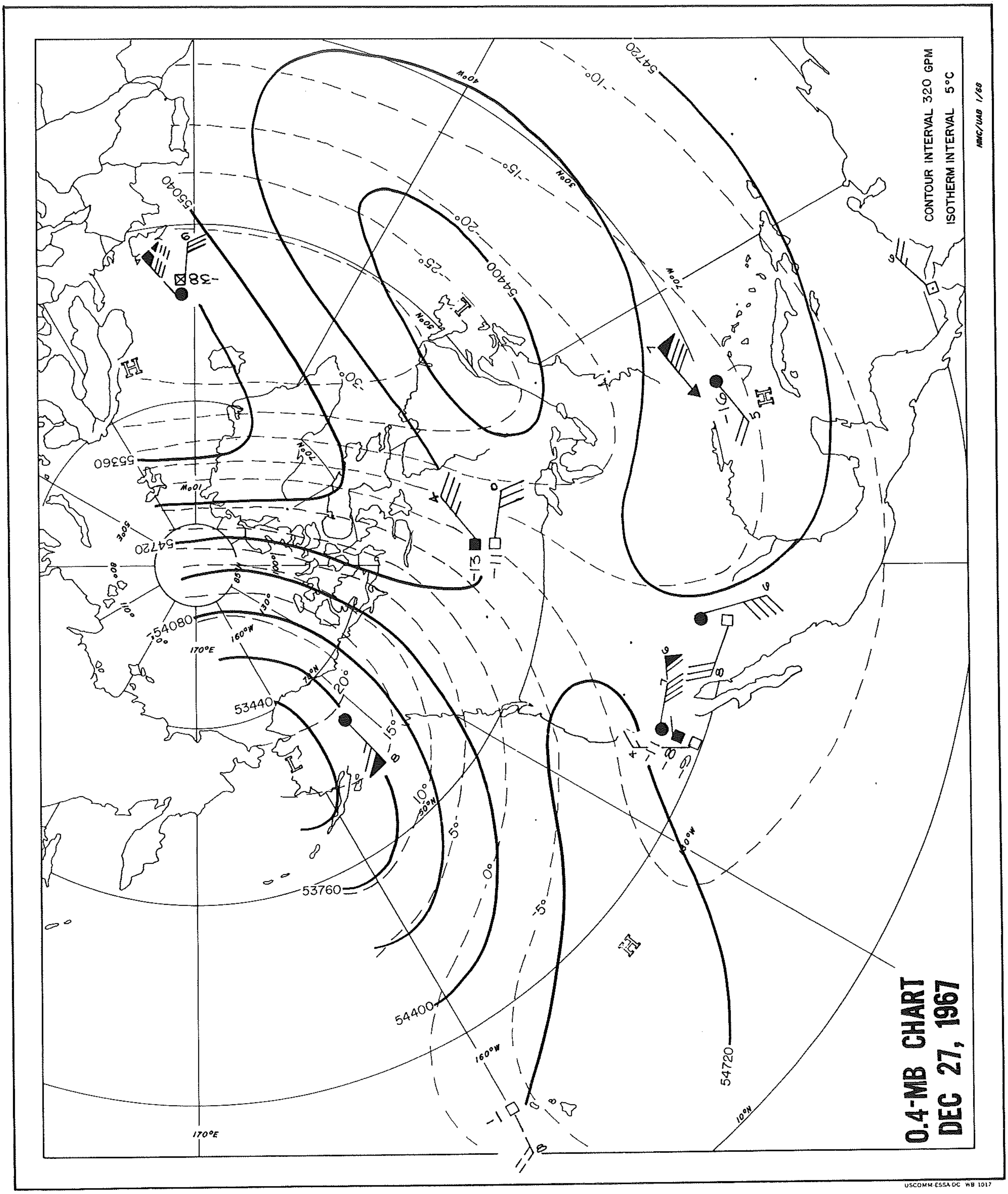

2-MB CHART
DEC 27, 1967
CONTOUR INTERVAL 320 GPM
ISOTHERM INTERVAL 5°C
39680
40000
40320
40640
40960
41280
41600
41920
42240
42560
42880
43200
43520
H
L
USCOMM-ESSA-DC WB 1017


0.4-MB CHART
DEC 27, 1967
CONTOUR INTERVAL 320 GPM
ISOTHERM INTERVAL 5°C
NMC/UAB 1/68
USCOMM-ESSA-DC WB 1017